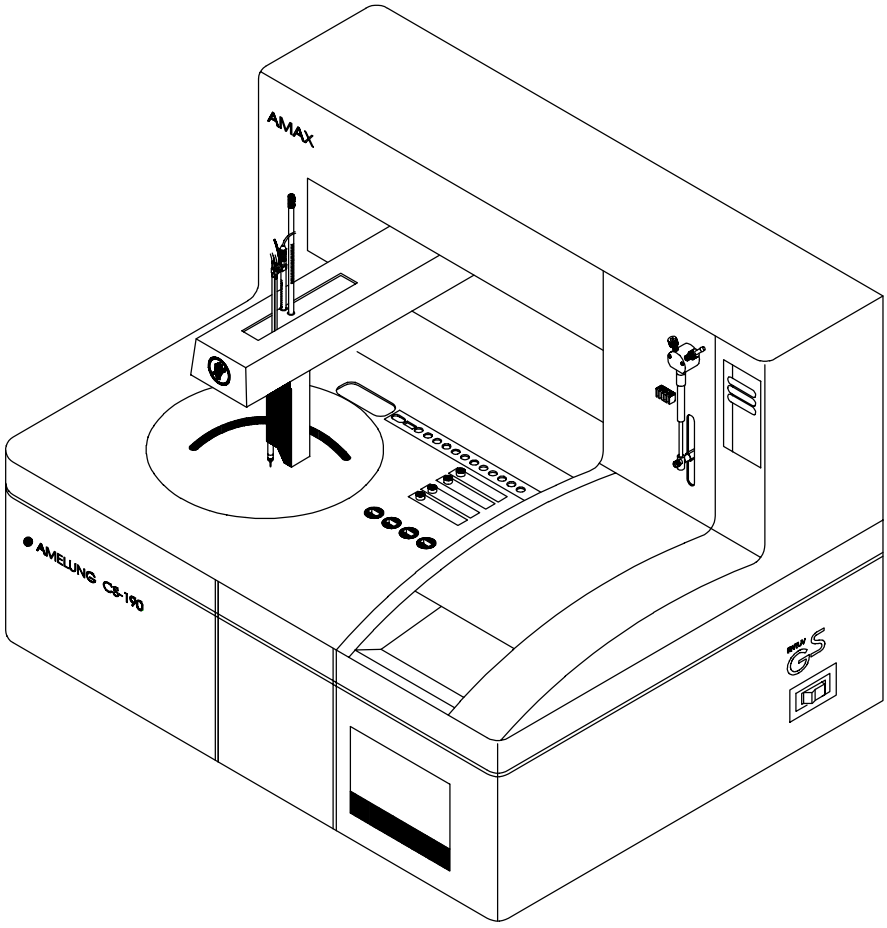
● AMELUNG AMAX CS-190
Service Manual



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2.1 Brief Description of the Operational Characteristics of the AMAX CS-190

- The AMAX CS-190 is a fully automated coagulation instrument.
- The AMAX CS-190 is used for measuring the in-vitro coagulation times. Both plasma and whole blood samples can be used.

5.5

- The instrument features an optical and a mechanical measuring unit.

6.

- In addition to the clotting tests, chromogenic (kinetic) tests can be carried out by using the optical measuring unit.

5.5

- The measured results can be converted to concentration or activity data with the help of storable standard curves.
- The PC identifies and stores patient samples and data.
- The samples are aspirated from their primary containers with a needle by way of the XYZZ-robot probe. Then the samples are mixed in a measuring cuvette with either a reagent and/or a buffer. After that the samples are incubated in the incubation rail (12 incubation slots).

8.6
8.3

- At the end of the incubation period, the XYZZ-robot moves the cuvette into the optical or mechanical measuring unit.

8.6
6.1
6.2
6.3

- After the addition of the starting reagent by the XYZZ-robot, the coagulation time is measured.
- Reagents, volumina and incubation periods can be programmed **individually**.
- Measured results and their calculations can be printed out in a protocol and stored simultaneously in the PC's patient archive.
- In addition, the results can be transferred to an external EDP (laboratory EDP) via bidirectonial data transfer.

2.2 Traffic Lights

The traffic lights are positioned in the upper, right corner of the AMAX CS-190 next to the dilutor unit (user position in front of the instrument). The light signals have the following meanings:

Tab. 2.2.1

Light signal	Meaning
no light	AMAX CS-190 software booted, no errors registered, processing not yet started.
green light	AMAX CS-190 software booted, no errors registered, processing started
yellow light	**WARNING:** missing cuvettes, waste water reservoir full, fresh water reservoir empty, plasma-reagent-tray cover open, photometer lamp switched off
red light	**ERROR:** temperature outside operating range, photometer lamp not yet ready
green + **red** light	**ERROR:** XYZZ - waste water well full
running light	**CANCEL:** press any key - Instrument is aborting current process.

2.3 Pictograms

This service manual describes the maintenance and repair of the automatic coagulation instrument AMAX CS-190.

These instructions are written for qualified medical and technical personnel.

IMPORTANT!
Read these instructions carefully and work only in the prescribed manner!

Pay attention to warnings and notices!

Only in this way can damage to man and machine be avoided!

To increase the overall understanding of this manual, the following pictograms are used:

ATTENTION!
There is **DANGER TO LIFE** of the user!
Read these instructions carefully and work only in the prescribed manner!
Pay attention to warnings and notices!

Only in this way can damage to man and machine be avoided!

ATTENTION!
The AMAX CS-190 can be damaged!
Read these instructions carefully and work only in the prescribed manner!
Pay attention to warnings and notices!

Only in this way can damage to man and machine be avoided!

IMPORTANT / NOTICE!
Requires additional operator action
or alteration of the adjustment parameters.

also see chapter **#**

one turn to the ‘right’ (clockwise) **1**↱

one turn to the ‘left’ (anti clockwise) **1**↰

Amelung specific part number (Q00000)

Key on the PC-keyboard **<X>**

3. Safety Regulations

3.1 Information on How to Avoid Danger to Life and Health 3 – 1
3.1.1 General Information 3 – 1
3.1.2 Information on the Repair of the AMAX CS-190 3 – 1

It is guaranteed that the user is protected from **danger** to life and health when using the AMAX CS-190 in compliance with the regulations (§ 3(1) MedGV).

3.1 Information on How to Avoid Danger to Life and Health

3.1.1 General Information

- If the AMAX CS-190 shows any defects which might endanger patients or user personnel, it must not be operated (§ 6(1) MedGV).
- Wear protective clothing, especially protective gloves. It is a possibility that infected plasma (dangerous substances) might be touched.
- Protective clothing, especially protective gloves which were in contact with dangerous substances (e.g. infected plasma) have to be changed and disposed immediately (Technical rules for dangerous Substances (TRGS)).
- Plasma samples, reagents and waste water are toxic waste. The toxic waste has to be disposed in compliance with the operative regulations (laboratory regulations).

3.1.2 Information on the Repair of the AMAX CS-190

- While under repair the instrument must not be used for testing.
- After a repair, the AMAX CS-190 has to undergo a functionality check. This involves the carrying out of checking measurements. These actual values have to be equivalent to the theoretical values.

ATTENTION!
Live parts (power unit and connection panel) must not be touched!
DANGER TO LIFE!

ATTENTION!
On certain parts (photometer lamp or lamp casing) there is a
DANGER OF BURNS!

IMPORTANT!
Regular maintenance helps to avoid malfunctions and protects the AMAX CS-190 from damage.

4. Accessories / Equipment

4.1 Measurement and Adjustment Tools for Repairs 4 – 1

4.1 Measurement and Adjustment Tools for Repairs

It is recommended to always carry the following tools and adjustment gauges at every AMAX CS-190 service intervention:

Tab. 4.1.1

Measuring instruments / Tools	Catalog no.
Thermometer	121563
Surface probe	121565
Immersion probe	121564
Digital multimeter	
Oscilloscope incl. probes: 1:1 / 1:10	
Adjustment gauge I (magazine light barriers)	J01847
Adjustment gauge II (row pusher end light barrier)	J01827
Adjustment gauge III (adjustment gauge lifting solenoid)	J01819
Adjustment gauge (alignment pusher 1 unit)	J01820
Needle ejector tool	J01818
Spring balance	890300
Adjustment tool auto photometer height	J01817

5. Technical Data

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5.6		Throughput of the AMAX CS-190	5 – 5

5.1 Measurements

AMAX CS-190

• Height	ca.	56 cm (22.5 inches)
• Width	ca.	82 cm (32.75 inches)
• Depth	ca.	69 cm (27.75 inches)

Commander PC

• Height	ca.	12 cm (4.75 inches)
• Width	ca.	40 cm (16 inches)
• Depth	ca.	44 cm (17.75 inches)

Monitor (14 inches)

• Height	ca.	37 cm (15 inches)
• Width	ca.	35 cm (14 inches)
• Depth	ca.	39 cm (15.75 inches)

optional: Monitor (15 inches)

• Height	ca.	39 cm (15.75 inches)
• Width	ca.	39 cm (15.75 inches)
• Depth	ca.	36 cm (14.5 inches)

Keyboard

• Height	ca.	4 cm (1.5 inches)
• Width	ca.	46 cm (18.5 inches)
• Depth	ca.	17 cm (6.75 inches)

Printer

• Height	ca.	17 cm (6.75 inches)
• Width	ca.	36 cm (14.5 inches)
• Depth	ca.	21 cm (8.5 inches)

Base cabinet for the AMAX CS-190

• Height	ca.	71 cm (28.25 inches)
• Width	ca.	82 cm (32.75 inches)
• Depth	ca.	69 cm (27.75 inches)

5.2 Weights

• **AMAX CS-190**	ca.	130 kg (286 pounds)
• **Base cabinet for AMAX CS-190**	ca.	78 kg (172 pounds)
• **Commander PC**	ca.	10 kg (22 pounds)
• **Monitor**	ca.	11 kg (24.2 pounds)
• **Printer**	ca.	2,5 kg (5.5 pounds)

5.3 Electrical Connection Data

AMAX CS-190

• supply voltage		90-132 / 180-265	VAC
• supply frequency		47-63	Hz
• power consumption	cold, max:	690	VA
	warm, min:	230	VA
• heat emission		1240	kJ/h

Commander PC

• supply voltage	90-132 / 180-264	VAC
• supply frequency	50-60	Hz
• power consumption	145	VA

Monitor

• supply voltage	100-240	VAC
• supply frequency	47-63	Hz
• power consumption	80	VA

Printer

• supply voltage	230	VAC
• supply frequency	50	Hz
• power consumption	30	VA

5.4 Temperatures

The internal components of the Amelung Amax CS-190 are heated or cooled automatically. In order to guarantee the perfect performance of the AMAX CS-190, the following instructions have to be followed:

- The AMAX CS-190 must not be placed directly in front of a wall. **(minimum distance 15 cm)**
- The ventilation grids must never be obstructed in any way. (Cooling the AMAX CS-190 would be impossible)
- The system fluid supply has to be sufficient at all times. 9.1
- To provide a sufficient air flow, the air filter has to be clean. 9.2
- Do not expose the AMAX CS-190 to direct sunshine. The room temperature must **not exceed 32°C**.

ATTENTION!
Disregard may lead to malfunction of and cause damage to the AMAX CS-190!

5.4.1 Temperatures of the Individual Modules

- reagent plasma barcode tray ca. 16.5 ± 1.5°C
- incubation rail ca. 37.5 ± 0.3°C
- optical measuring unit ca. 37.5 ± 0.3°C
- mechanical measuring unit ca. 37.5 ± 0.3°C
- cuvette magazine ca. 37.5 ± 0.3°C
- pre-heater ca. 40.0 ± 0.5°C
- cooling water system ca. 25 - 55°C
- warm water circuit (37°C)
  washing in the well ca. 38.5 ± 0.5°C
  pumping in the well ca. 38.5 ± 0.5°C

The temperature in the well is measured by a liquid thermometer.

In the user software (main menu), select “Maintenance”, then “Wash”. The temperature is measured during the process “Wash” and “Fill”.

The warning limits for the temperatures can be entered in the user interface software.

In the case of a divergence, a message will be displayed on the monitor and the status lights will show yellow. 2.2

show yellow.

In addition, an acoustic signal will sound and the AMAX CS-190 will not reactivate.

5.5 Intended Use

The AMAX CS-190 measures in-vitro coagulation times and chromogenic test reactions. Both citrated whole blood and citrated plasma samples can be used.

You can choose between the mechanical measuring and the optical measuring mode. Depending on the used reagents and measuring methods the following hemostasis parameters can be determined:

- **Prothrombin time (PT/Quick)**
- **Hepato-Quick**
- **Activated Partial Thromboplastin Time (APTT)**
- **Thrombin time (TT)**
- **Fibrinogen (Clauss)**
- **Fibrinogen (derived, optical density measurement)**
- **Normotest**
- **Thrombotest**
- **Factor assays: II, V, VII, VIII, IX, X, XI and XII**
- **AT III**
- **Plasminogen**
- **Antiplasmin**
- **PAI**
- **Heparin**
- **Protein S**
- **Protein C**
- **APC-Resistance**
- **and more**

5.6 Throughput of the AMAX CS-190

The throughput of the AMAX CS-190 is influenced by the type of measuring method used.

Tab. 5.6.1

		patients/hour	patients/hour
	tests/hour	single	double
PT-mechanical (pipetting mode 0)	180	180	90
PT- mechanical (pipetting mode 2)	240	240	120
PT-optical (pipetting mode 0)	190	190	95
PT-optical, derived fibrinogen	240	120	60
APTT-mechanical or optical	110	110	55
Fibrinogen (Clauss)	115	115	57
AT III	80	80	40
Factor assays	120	120	60
PT-mechanical/APTT	120	60	30
PT-mechanical/APTT/AT III	90	30	15

6. Measuring Methods

6.1	Mechanical Measuring Mode	6 – 1
6.2	Optical Measuring Mode (Clotting)	6 – 2
6.3	Optical Measuring Mode (Chromogenic)	6 – 4

The AMAX CS-190 features a mechanical and an optical measuring unit.
The mechanical measuring unit has 4 measuring cells which work with the ball method.

The optical measuring unit (photometer) has 4 measuring channels for measurement of the optical density. The wavelength of the light is 405nm.

The necessary total volumes for the measurements are:

- Mechanical measuring mode, minimum volume: 75µl
- Optical measuring mode, minimum volume: 150µl
- **Maximum volume** (mechanical, optical): 600µl

The individual measuring modes are described on the following pages.

6.1 Mechanical Measuring Mode

The time between the addition of the starting reagent and the beginning of the formation of fibrin is measured.

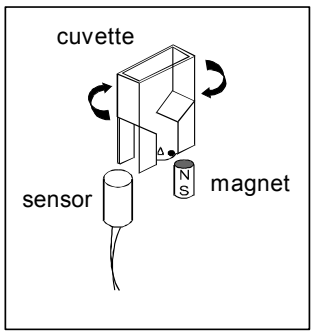
The sample and if necessary the reagent and/or buffer are pipetted into a measuring cuvette. After the incubation time it is placed into one of the mechanical measuring channels automatically.

There is a special steel ball on the bottom of the cuvette.

With the addition of the starting reagent, the cuvette starts to rotate around its longitudinal axes while the ball is held in a certain position by a magnet.

As coagulation begins, the ball is removed from its position by the forming fibrin threads, because the force of the magnet is overcome. A sensor detects the change of the ball's position and ends time measurement.

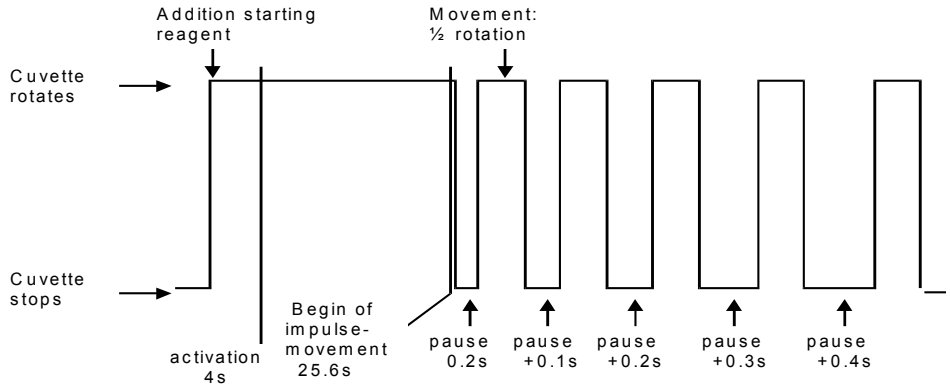
Pic. 6.1.1
schematic display of the mechanical measuring mode



Impulse measurement

In order to detect very unstable clots with the mechanical method, the continuous rotation of the cuvette can be changed to a rotation with intervals after a predefined time.
In the example on Pic 6.1.2, the continuous movement is switched to interval movement after 25.6s. During the intervals, which prolong automatically, a clot cannot be detected, but it has time to stabilise itself. The CV rises in dependence with the length of the interval.

Pic. 6.1.2
Impulse measurement



6.2 Optical Measuring Mode (Clotting)

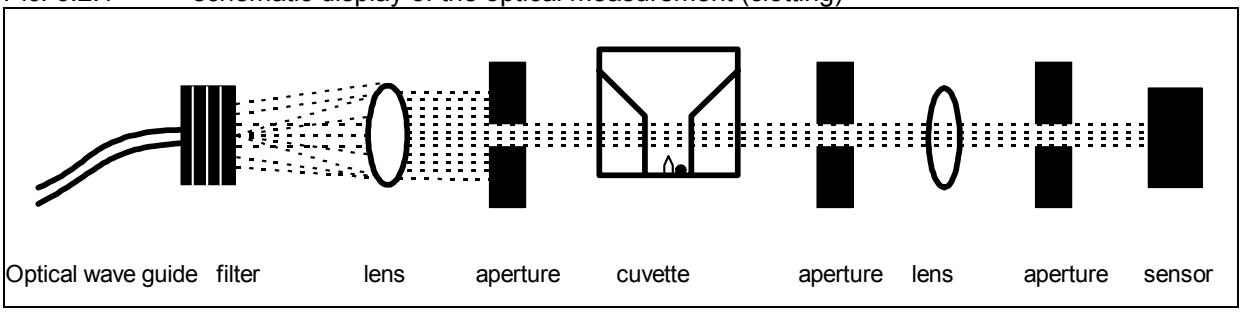
The time between the addition of the starting reagent and the beginning of the formation of fibrin is measured.

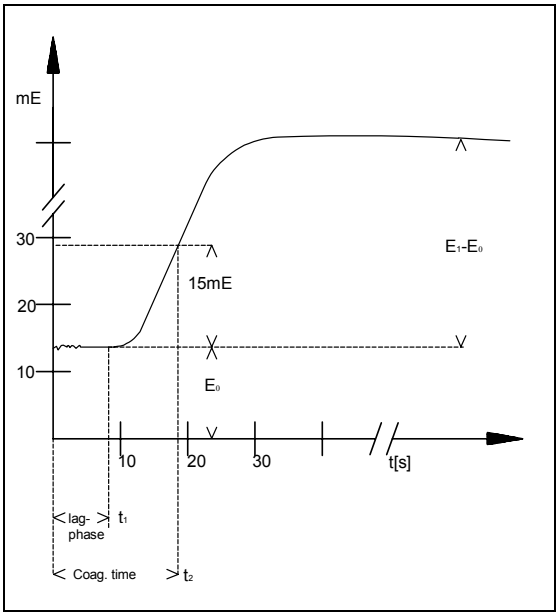
The sample and if necessary the reagent and/or buffer are pipetted into a measuring cuvette. After the incubation time it is placed into one of the optical measuring channels automatically.

The timing begins with the addition of the starting reagent. The intensity of the light beam that passes through the cuvette is monitored by a sensor. When clots are forming, the sample/reagent mixture becomes cloudy and the intensity of the light reaching the sensor decreases (turbidimetrical measurement).

As soon as the change in the optical density reaches a pre-set threshold, the time measurement stops.

Pic. 6.2.1 schematic display of the optical measurement (clotting)





Pic. 6.2.2
Analysis of the optical measurement (clotting)

The coagulation time t_2 is the time taken from addition of the starting reagent to the point when the absorbance change has achieved the predefined threshold value. The absorbance change is measured from the stable baseline value at E_0.
Example: 15mE (threshold value).

The derived fibrinogen is calculated from the difference between the maximum absorbance E_1 and the baseline value E_0.

6.3 Optical Measuring Mode (Chromogenic)

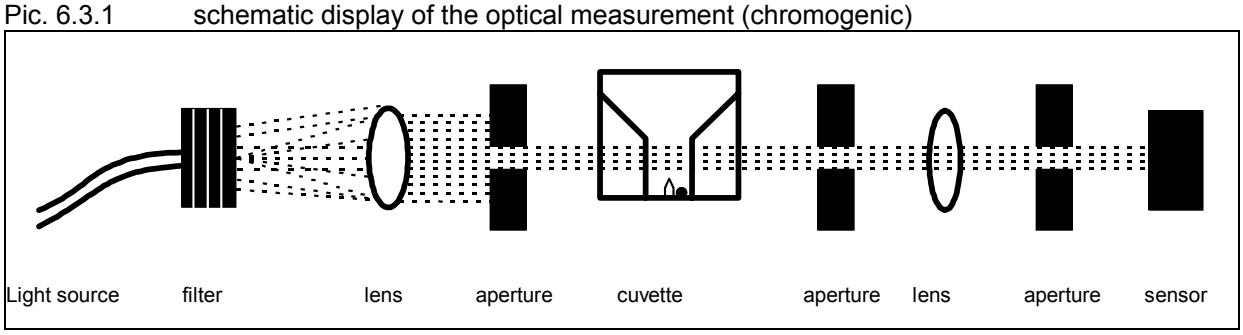
The rate of absorbance change is measured at predetermined intervals.

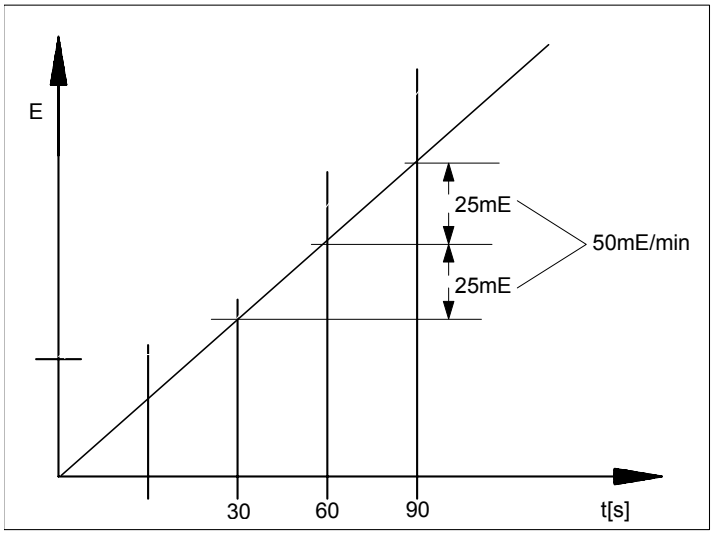
Sample and reagent are pipetted into a measuring cuvette and placed into one of the optical measuring channels. After the addition of the starting reagent, measurements are taken in defined intervals.

A monochrome light beam (405nm) passes through the cuvette. The change in optical density is measured by a sensor behind the cuvette at pre-defined intervals (kinetic measurement).

The values of change in mE/t are further mathematically processed.

Pic. 6.3.1 schematic display of the optical measurement (chromogenic)





Pic. 6.3.2
Analysis of the optical measurement (chromogenic)

The absorbance increase within a defined interval (30/60/90) is measured and converted into E/min.
The rate of absorbance change must be constant (linear).

7. Instrument Installation

7.1		Instrument Overview	7 – 1
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7.3		PC & Accessories	7 – 3
	7.3.1	Jumper Settings of the AML-BUS-PC-Board	7 – 4
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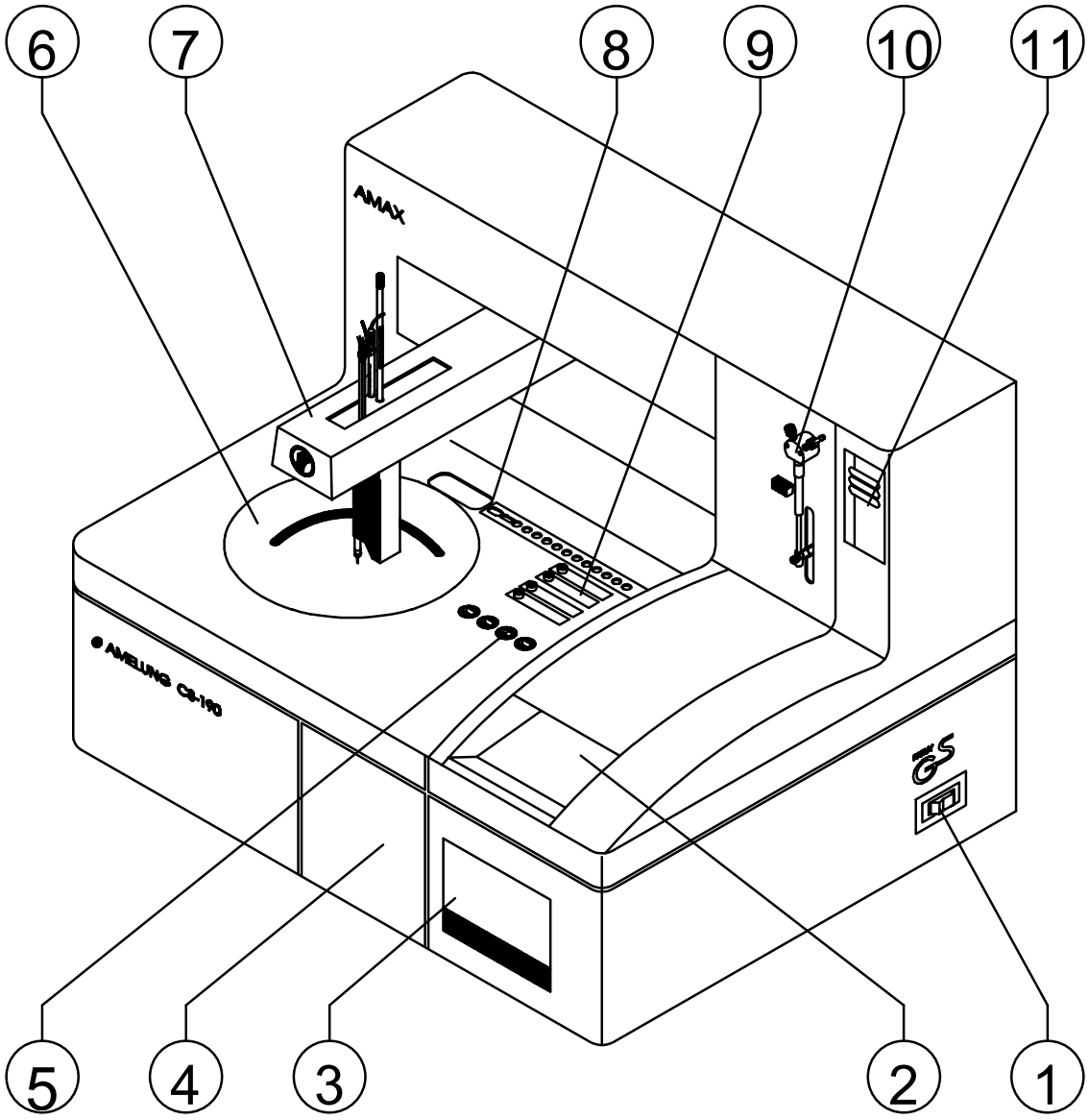
7.6		Turning on the Instrument	7 – 9

7.1 Instrument Overview

Pic. 7.1.1



Tab. 7.1.1

Overview	[Chapter]
1. Mains switch	7.5
2. Cuvette magazine (front feed chute)	8.3 / 11.3
3. Cuvette magazine (front disposal chute)	8.3 / 11.3
4. Drawer (Disposal)	9.8
5. Mechanical measuring unit	8.2 / 11.2
6. Reagent-plasma-barcode	8.4 / 11.4
7. Robot (XYZZ)	8.6 / 11.6
8. Incubation rail	8.3 / 11.3
9. Photometer	8.5 / 11.5
10. Dilutor	8.1 / 11.1
11. Traffic lights	2.2

7.2 Installation of the AMAX CS-190

1. Remove the packaging material of the AMAX CS-190 and level the instrument on the base cabinet.
   Fasten the connecting bolts which connect the base cabinet and the instrument.

2. **Do not turn on the instrument yet!**
   All movable parts were secured for transport.
   (XYZZ-robot: all axes were secured)
   Remove all shipping clamps.
   (check driving belt XY-axes, tapes, paper boards, etc.)
   Check all movable parts for free movement.

3. Check the system coolant level,
   if necessary fill up with original system liquid.
   (830040 (500ml bottle)). → 9.1

4. Configure PC & Accessories. → 7.3

5. Connect the fresh/waste water reservoir and the liquid level sensors. → 7.5

6. Establish all electrical connections between the PC and the AMAX CS-190.

7. Now the AMAX CS-190 can be turned on. → 7.6

ATTENTION!
Remove all shipping clamps and securing devices before turning on the instrument.

Disregard may lead to malfunction of and cause damage to the AMAX CS-190!

Packaging material is recycable!

7.3 PC & Accessories

1. Remove all packaging material of the PC, monitor, printer, etc.
   In case the AML-Bus-Board (Board PH-PC (D02801)) or the modem board (Z04005) have not yet been installed, the PC has to be opened and the boards have to be placed into free slots.
   Check and correct the jumper settings (see below) before the installation. Disregard may lead to malfunction or conflicts with other components.
2. Connect all components (**except** for the PC and the AMAX CS-190!) and establish all electrical connections.
3. Install the software:
   First, switch on the PC, screen and printer. The PC installs its operating system automatically (selection: WINDOWS 3.1) After approx. 30 min. the installation is complete and you can continue by yourself. Deinstall WINDOWS with only the **DOS prompt** remaining on the hard drive.

   Now the main software can be installed.
   It consists of three or five 3,5” disks:
   a. Disk with main menu AMAX CS-190
   b. Disk for service software
   c. Disk for AMAX CS-190 (instrument specific data)
   d. Disk for modem software (option)
   e. Disk for printer driver
      (printer specific)

7.4

7.3.1 Jumper Settings on the AML-BUS-PC-Board

There are two dip-switches on the **Board PH-PC** for adjusting the address.
The following switch adjustments have to be made so that the board can be identified:

Tab. 7.3.1

Dip-switch S1	Position	Dip-switch S2	Position
Switch 1	on	Switch 1	on
Switch 2	on	Switch 2	off
Switch 3	on	Switch 3	off
Switch 4	off	Switch 4	off

ATTENTION!
Disregard may lead to malfunction of the AMAX CS-190!

7.3.2 Jumper Settings of the Modem Boards

The different modems are not distinguishable by their names. For their differentiation, the BZT-No. is used here. This BZT-No. is printed on the packaging and on a label on the modem itself.

Tab. 7.3.2

Designation **Internal fax-modem BZT-No.** (Company)	**Switch position for Com 3 IRQ 5**
BZT - No. A109 822D	2,3,8
BZT - No. A107 434D (YAKUMO)	2 and 7 (7 is a soldering bridge)
BZT - No . A121 250F (CREATIX)	switch 1 and 6 to ON all others to Off
BZT - No. A106 901D	switch 1 and 6 to ON all others to Off
The initialisation string for these modems is: **ATE0Q0V0L1X3%C1\N3\V1S0=2S7=100^M**	

ATTENTION!
Disregard may lead to malfunction of the AMAX CS-190!

7.4 Printer Installation

There are different types of printer which can be used in combination with the AMAX CS-190.

Examples for installation:

1. Printer type Canon **BJC-240**
   An installation disk **(BJ-setup program)** for **DOS** is delivered along with the printer. Installation is carried out according to the disk label or the printer's user manual **(directory: C:\bjprn)**. The printer has to be turned on and connected to the PC. After the initiation of the printer software the settings of the printer control mode can be checked. The mode **must** be set to LQ-Mode. To complete the installation, the adjusted data has to be transferred to the printer with the function key **<F10>.**

ATTENTION!
Disregard may lead to malfunction of the AMAX CS-190!

2. Printer type Canon **BJ-200**
   There is no installation disk for this printer. This printer is adjusted manually by using the dip switches:

Tab. 7.4.1

Dip-switch	Position
Switch no. 01	on
Switch no. 02	on
Switch no. 03	off
Switch no. 04	on
Switch no. 05	on
Switch no. 06	off
Switch no. 07	on
Switch no. 08	off
Switch no. 09	off
Switch no. 10	on
Switch no. 11	off
Switch no. 12	off

ATTENTION!
Disregard may lead to malfunction of the AMAX CS-190!

3. Printer type Canon **BJ-200 ex**
   There is no installation disk for this printer. This printer is adjusted manually by using the dip switches:

Tab. 7.4.2

Dip-switch	Position
Switch no. 01	on
Switch no. 02	on
Switch no. 03	off
Switch no. 04	on
Switch no. 05	off
Switch no. 06	off
Switch no. 07	off
Switch no. 08	off
Switch no. 09	off
Switch no. 10	off
Switch no. 11	on
Switch no. 12	off

ATTENTION!
Disregard may lead to malfunction of the AMAX CS-190!

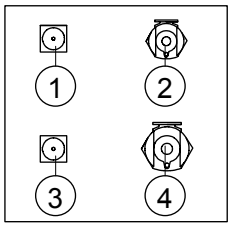
7.5 Connections

7.5.1 Fresh Water / Waste Water System

There is a connection panel for the fresh water / waste water system. Pic. 7.5.1.1 shows the connection panel.
Connect the tubing (Q90006 / Q90007) with the panel and each fresh water / waste water reservoir (Q90004 / Q90005). In order to ensure perfect functioning, the tubing connectors have to lock into place precisely (audible). The tubing sets each have a cable with a BNC connector, which also have to be connected. The cables must not be interchanged because they are the control cables for the liquid level sensors in the reservoirs. Pic. 7.5.1.2 shows the position of the reservoirs. Pic. 7.5.1.3 shows the connections of a reservoir.

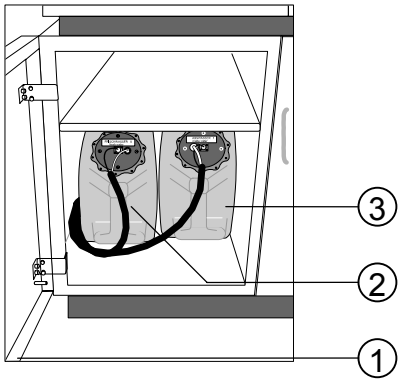
ATTENTION!
Disregard may lead to malfunction of the AMAX CS-190!

Pic. 7.5.1.1
Connection panel with level sensor connections



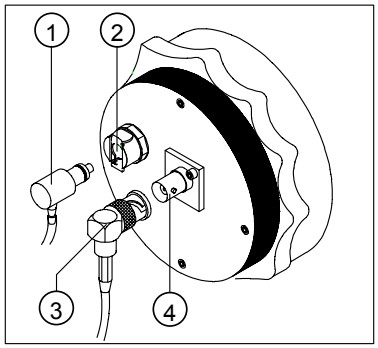
1. Plug contact - Fresh water level sensing
2. Fresh water connection
3. Plug contact - Waste water level sensing
4. Waste water connection

Pic. 7.5.1.2
Position of the reservoirs in the base cabinet



1. Base cabinet (left door)
2. Waste water reservoir
3. Fresh water reservoir

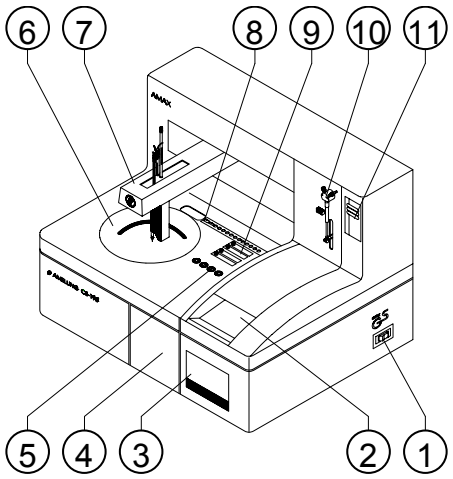
Pic. 7.5.1.3
Reservoir screw-lid with connections



1. Tubing
2. Connection socket for the tubing
3. Cable - Level sensor
4. Connection socket for the cable

7.5.2 Electrical Connections

Pic. 7.5.2.1



Before working on the electrical connections:

IMPORTANT!
AMAX CS-190, PC, monitor and printer have to be turned off (switch position 0/AUS or OFF).

Pic 7.5.2.1 No. 1 shows the instrument main switch.

Technical data:

Switch:
Version (230V / 3.5A) (244210)
Version (110V / 6A) (244216)

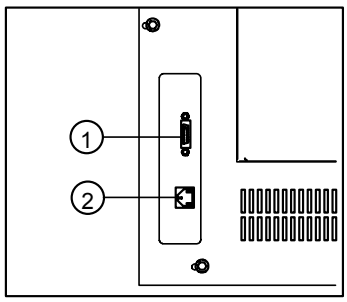
ATTENTION!
The instrument fuse (reversible fuse) is positioned inside the mains switch. Replacing it after an activation is not necessary!

ATTENTION!
Disregard may lead to malfunction of the AMAX CS-190!

On the rear side of the AMAX CS-190 is a connection panel for the electrical connections (user position in front of the instrument).

Connect the 15-pin AML-Bus-cable (X10183) between the AMAX CS-190 and the PC.
The cable has to be screwed into the panel and the PC correctly in order to function normally.

Pic. 7.5.2.2
Connection panel



1. AML-Bus connection
2. Power connection

Now connect the power cable to the AMAX CS-190 and a suitable power supply. (Fuse protection: 16A (safety cut-out: slow)).
In addition, PC, monitor and printer have to be connected to the power supply.

5.3

ATTENTION!
Disregard may lead to malfunction of the AMAX CS-190!

7.6 Turning on the Instrument

If you have completed all steps successfully, you now may switch on all devices:

First turn on the AMAX CS-190, then all other components!

The AMAX CS-190 moves to its home position (all modules are initialised).

The instrument is ready when the traffic light shows **no** light and the screen shows the main menu.

2.2

ATTENTION!
The instrument must not be turned on and off in short intervals (wait at least 10-15 seconds).

Disregard may lead to malfunction of the AMAX CS-190!

8. Subassemblies

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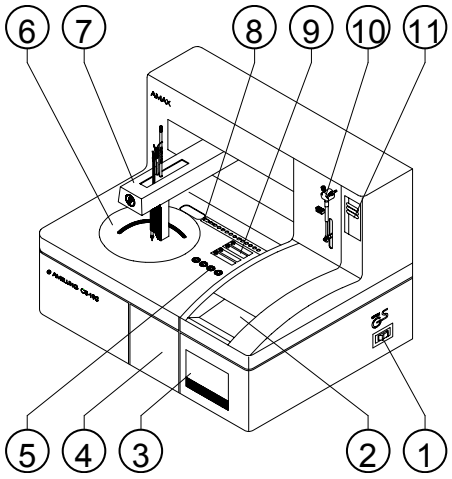
8.1 Dilutor



Pic. 8.1.1
Dilutor unit (10)

Tab. 8.1.1 Structure dilutor unit (Q10007)

mechanical subassemblies		electronic subassemblies	
Dilutor component XL 3000W	(246005)	AM-DIL board	(D05701)
Pre-heater	(Q10020)	PH-MCK II board	(D03601)

There is a dip-switch on the PH-MCK II board for adjusting the module address. It also contains the program-IC (integrated chip) IC1, which can be replaced to update to a new program version.

The following switch adjustments have to be carried out so that the module can be identified.

Tab. 8.1.2

Dip-switch S1	position
Switch no. 1	on
Switch no. 2	off
Switch no. 3	off
Switch no. 4	off
Module address: 1	

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

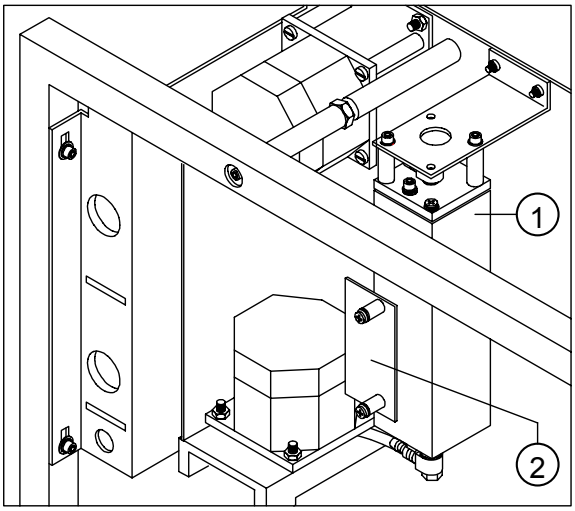
8.1.1 Adjusting the Temperature of the Pre-heater

In order to carry out the adjustments, the following instrument casings have to be removed:

Rear casing (123268)

The pre-heater is positioned in the top left corner (dilutor unit) of the instrument (user position behind the instrument).

Pic. 8.1.1.1



Pre-heater (Q10020) (1)

Heating:
PH-I-HZ II board (D01101)(2)

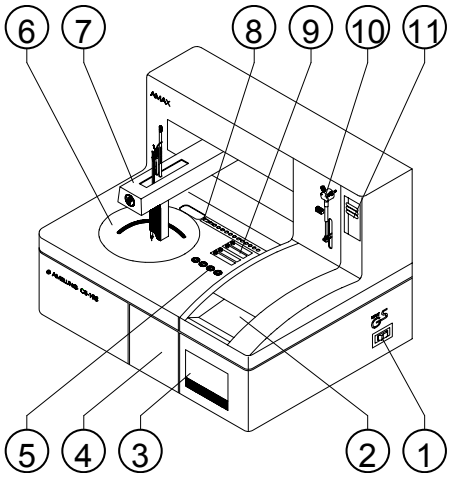
The theoretical value of the heating is adjusted on the PH-I-HZ II (D01101) board (on which the pre-heater is mounted) by using the potentiometer ***R16.***

1↱ = approx. - 1.0°C / **1**↰ = approx. + 1.0°C

As long as the LED V1 is lit, the heating is active and the temperature rises. The temperature of the reservoir should be 40°C ± 0.5°C .

The temperature is measured using a contact thermometer directly at the brass container through a hole in the pre-heater insolation.

8.2 Mechanical Measuring Unit



Pic. 8.2.1
Mechanical measuring unit (5)

Tab. 8.2.1 Structure mechanical measuring unit (Q10011)

mechanical subassemblies		electronic subassemblies	
knee joint	(D10074)	AM-M-SH board AM-M-HT board PH-TF board AM-S-HY board PH-HALL board	(D06901) (D06301) (D06801) (D06201) (D05201)

The PH-MCK (D00801) board is not in the module. It is integrated in the subassembly reagent/measuring unit drive (Q10080).

There is a dip-switch for adjusting the module address on the PH-MCK board. It also contains the program-IC (integrated chip) IC1, which can be replaced to update to a new program version.
The following dip switch adjustments have to be carried out so that the module can be identified.

Tab. 8.2.2

Dip-switch S1	position
switch no. 1	off
switch no. 2	off
switch no. 3	on
switch no. 4	off
Module address: 2	

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.2.1 Removing the Measuring Unit

In order to remove the measuring unit, the following instrument casings should be removed:

Upper structure	**(123290)**
Side casing left	**(123289)**
Working area	**(123292)**
Front plate left	**(123293)**
Side casing right	**(123291)**
Front plate right	**(123294)**
Magazine cover	**(122432)**

8.2.2 Adjusting the Measuring Block Temperature

The adjustments have to be carried out on the AM-M-SH (D06901) board. Place cuvettes, filled with approx. 200 µl water in the measuring channels.

In order to adjust the temperature of the measuring unit, the following instrument casings should beremoved:

Upper structure	**(123290)**
Side casing left	**(123289)**
Working area	**(123292)**

The supply voltage should be turned on. The theoretical value of the heating is adjusted with potentiometer ***R27***.

1↱ = approx. + 1.0°C / **1**↰ = approx. - 1.0°C

As long as the light-emitting diode LED V4 is lit, the heating is active and the temperature rises. The current temperature can be measured in the cuvettes using the liquid thermometer.

The temperature should be at 37.5°C ± 0.3°C when LED V4 goes out (after approx. 15 minutes).

5.4

The adjustment process is complete when the temperature of each cuvette is constant. After successful adjustment, the measuring block has a temperature of approx. 38.5°C. The temperature if measured on the sides of the aluminium block.
The adjustment can be carried out outside the instrument as well. The ambient air around the instrument should not be too cold (avoid draughts).
The adjustment should be checked again after the measuring unit has been reinstalled.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.2.3 Adjusting the PC Temperature Display

This adjustment is carried out on the PH-TF (D06801) board.

The current temperature of the measuring block can be queried using the ***service program***.

11.2

The displayed value can be altered (adjusted) with potentiometer ***R7.***

1↱ = approx. - 0.5°C / **1**↰ = approx. + 0.5°C

The temperature should be measured on the sides of the aluminium-block using the contact thermometer. This value should then be adjusted to approx. 38.5 °C.

IMPORTANT!
The temperature displayed by the PC in the service program should always be equivalent to the current temperature.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.2.4 Adjusting the Inductive Ball Sensors

The adjustment is carried out at the ball sensors (D10079).

The mechanical measuring unit should be operational before the adjustment. The supply voltage should be turned on and the temperature should be adjusted correctly. Otherwise, the temperature adjustment has to be repeated (see: Adjusting the measuring block temperature).
An empty cuvette with a ball should be placed into every measuring channel. It is important that all measuring channels are closed.

The voltage to be adjusted can be measured on the AM-S-HY board (D06201) at MP2 using a multimeter. First, a voltage of approx. 2.9-3.1 Volt is adjusted. The adjustment is altered using the potentiometer in the ball sensor.

↱ = **-** / ↰ = **+**

After an operation time of about 10 minutes, a voltage of 3.8 volts should be adjusted. Now, in order to check its functionality, the measuring unit can be started in the ***service program***.

11.2

After the measuring channels have been started, they are stopped by blocking the ball using a non-metallic object. The LED V4 flashes once. It signals the stop-impulse. When the measuring unit stops, the sensor system is ready for operation. The electrical

adjustment and functionality check should be rechecked after another 15 minutes. If necessary, 3.8 volts should be readjusted.

Finally, the ball is glued solid in the cuvette and the measuring channel is started. An oscilloscope is now connected to MP2. The X18 plug has to be disconnected from the AM-M-SH board or the X1 plug from the PH-M-MB board in order to interrupt the monitoring of the AM-S-HY board. Otherwise, the measuring channels would stop again.

An amplitude of at least 1.5 volts should be visible.
After the measurement, the X18 or X1 plugs have to be plugged back into the AM-M-SH board or the AM-M-MB board.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.2.5 Adjusting the Hinge Mechanism Voltage (knee joint)

The supply voltage for the hinge mechanism stepper motors is adjusted using the potentiometer on the AM-M-SH (D06901) board.

1↱ = approx. + 1.0 V / **1**↰ = approx. - 1.0 V

For that purpose, a digital voltmeter is connected to the LED V2 anode. The voltage should be 15 Volt ± 0.5 to guarantee a safe opening and closing of the hinge.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.2.6 Adjusting the Rotational Speed

In order to carry out the adjustment, the following instrument casings should beremoved:

Side casing left	**(123289)**
Front plate left	**(123293)**

The measuring unit should be operational.
One oscilloscope probe is connected to PIN 1 of plug X1 on the PH-M-MB (D05601) board.
The measuring unit channel no. 4 is started with the ***service program***.

11.2

Using the potentiometer ***R21,*** the speed is adjusted so that the interval length of the signal is 375ms.

1↱ = approx. - 30ms / **1**↰ = approx. + 30ms

This equals to 80 rpm (2 impulses per rotation of the measuring unit).

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.2.7 Adjusting the Motor Torque Voltage of the Measuring Units

The stepper motor supply voltage used for turning the measuring units is adjusted using the potentiometer ***R22*** on the PH-M-MB (D05601) board.

1↱ = approx. + 300mV / **1**↰ = approx. - 300mV

For this purpose, a digital multimeter is connected to the coil L1. The voltage must be approx. 6 volts ± 0.3 so that the measuring units can start smoothly and safely.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.2.8 Adjusting the Dip-switches on the PH-M-MB (D05601) Board

In order to carry out this adjustment, the following instrument casings should be removed:

Side casing left (123289)
Front plate left (123293)

There are two dip-switches on the PH-M-MB board: dip-switch S1 affects the stepper motors (complete- or half-step, direction of rotation); dip switch S2 affects the number of measuring units.

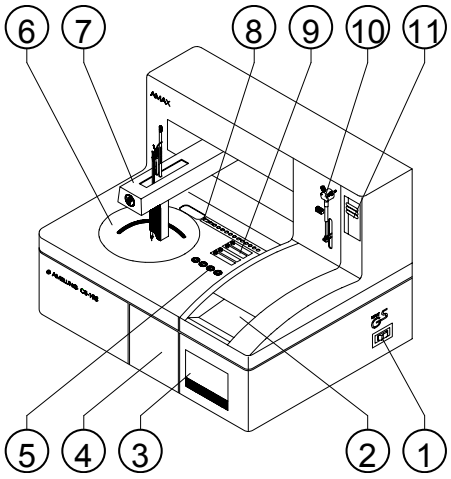
The following dip switch adjustments have to be carried out so that the mechanical measuring unit can function correctly.

Tab. 8.2.8.1

Dip-switch S1	position	Dip-switch S2	position
switch no. 1	on	switch no. 1	off
switch no. 2	on	switch no. 2	on
switch no. 3	on	switch no. 3	on
switch no. 4	off	switch no. 4	off

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.3 Cuvette Magazine



Pic. 8.3.1
Cuvette magazine (2 & 3)

Tab. 8.3.1 Structure cuvette magazine (D10007)

mechanical subassemblies		electronic subassemblies	
Pusher I	(D10032)	PH-K5 board	(D03401)
Pusher II	(D10033)	PH-MCK board	(D08001)
Side part I	(D10060)		
Side part II	(D10061)		
Conveyor I	(D10062)		
Conveyor II	(D10063)		
Lifting solenoid stops	(D10038)		
Incubation rail	(Q10005)		

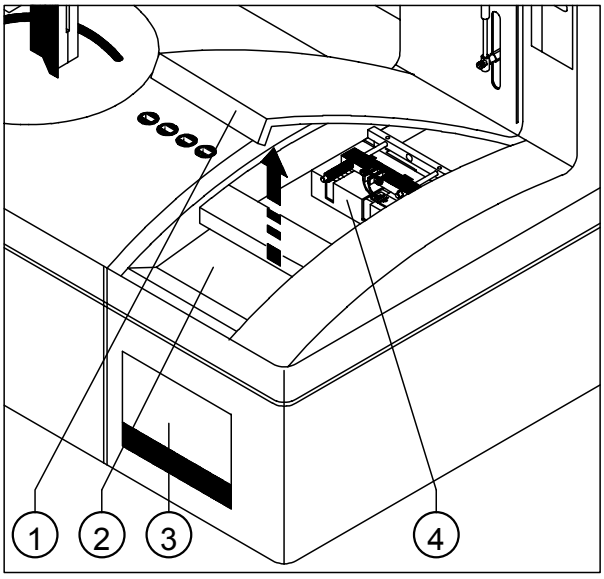
There is a dip-switch for adjusting the module address on the PH-MCK board. It also contains the program-IC (integrated chip) IC1, which can be replaced to update to a new program version.
The following dip switch adjustments have to be carried out so that the module can be identified.

Tab. 8.3.2

Dip-switch S1	position
switch no. 1	off
switch no. 2	off
switch no. 3	on
switch no. 4	on
Module address: 3	

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

Pic. 8.3.2



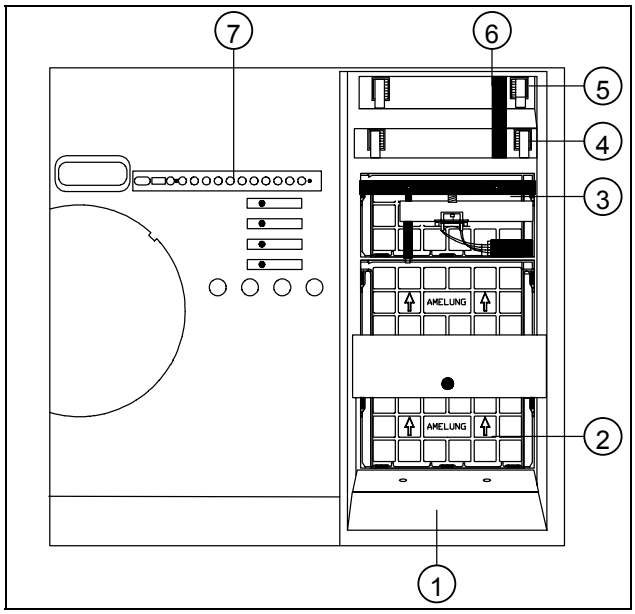
Cuvette magazine cover (1)

Cuvette box loading area (2)

Cuvette box disposal chute (3)

Cuvette box (4)

Pic. 8.3.3



Cuvette box loading area (1)

Cuvette box (2)

Cuvette comb (3)

Feed conveyor (4)

Disposal conveyor (5)

Row pusher (6)

Incubation rail (7)

8.3.1 Removing the Cuvette Magazine or the Incubation Rail

In order to remove the cuvette magazine or the incubation rail, the following instrument claddings should be removed:

Upper structure	**(123290)**
Side cladding left	**(123289)**
Work area	**(123292)**
Front plate left	**(123293)**
Side cladding right	**(123291)**
Front plate right	**(123294)**
Magazine cover	**(122432)**

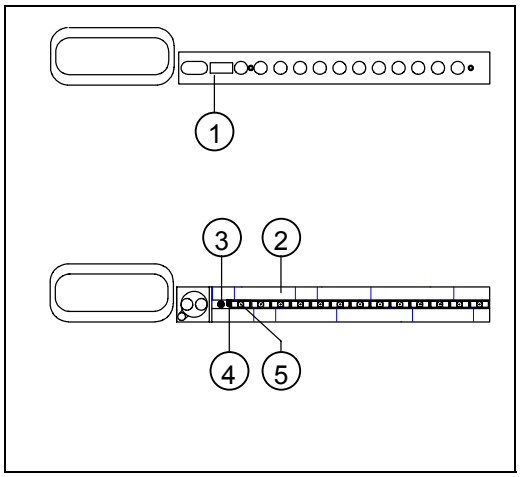
After that each module can be removed. The corresponding cable connections have to be detached: supply voltage, module connections, light barrier cable, BUS-connections.

8.3.2 Adjusting the Mixer in the Incubation Rail (Q10005)

In order to carry out the adjustment, the following instrument claddings should be removed:

Upper structure	**(123290)**
Side cladding left	**(123289)**
Work area	**(123292)**

Pic. 8.3.2.1



The incubation rail (2) with the integrated mixer unit (D10071) is positioned under the incubation rail cover. The mixer-position (4) is in front of the ejector-position (3) and the lifting solenoid-position (4). (Blocking position1).

The mixer can be started with the ***service program***.
The ball turns when a cuvette is positioned on the mixer position.

A stroboscopic effect can be observed when a line-powered (electric discharge lamp/ fluorescent lamp) lamp is held above the cuvette (assuming the rotational speed has been adjusted correctly). When the rotational speed is correct, **"3-4 stationary balls"** can be observed.

The rotational speed is adjusted with the potentiometer ***R43*** on the PH-K1 (D03001) board.

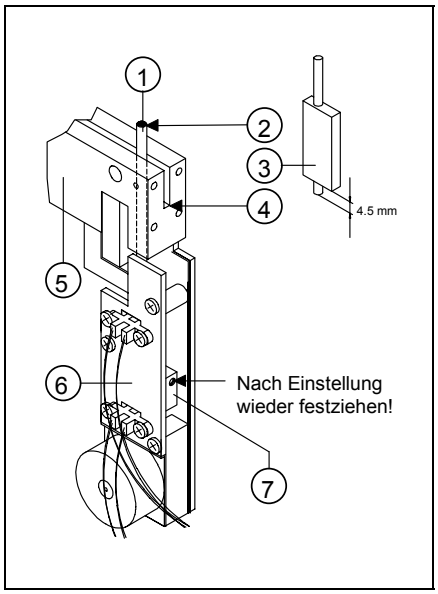
↱ = - / ↰ = +

8.3.3 Adjusting the Ejector (Q10030)

The cuvette ejector (6) plunger (1) is adjusted with the alignment gauge (J0XXX). The ejector unit (6) has to be connected to the incubation rail (5). The plunger is brought into the lower position. The alignment tool (3) is then held into the incubation rail. The short spike (4.5mm) has to be placed into the plunger exit position. The flat surface of the alignment gauge should now lie on the base of the incubation rail (4). Otherwise the two set-screws in the fish-plate (7) have to be loosened which allows the plunger to be pushed downwards until the flat surface of the alignment gauge comes to rest on the incubation rail base. The upper flat surface (2) of the plunger has to be 4.5mm deeper than the base of the incubation rail (4).
It must not be possible to move the plunger upwards against the alignment gauge. In this case, the ejector-plunger-position would be too deep.

After completing the alignment, the set-screws have to be tightened again.

Pic. 8.3.3.1



ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

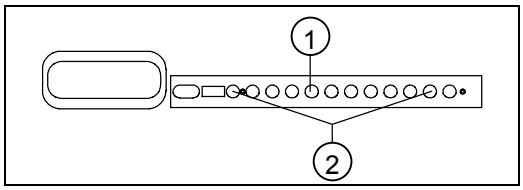
8.3.4 Checking the Lifting Solenoid of the Incubation Rail

In the incubation rail is a lifting solenoid (see Pic. 8.3.2.1 no.4) which blocks the position 1(ejector position).
The function of the lifting solenoid can be checked with a continuous test program in the ***service program.***
The lifting solenoid is activated and then powered off, it should spring out without any delay.

11.3

8.3.5 Adjusting the Temperature of the Incubation Rail

Pic. 8.3.5.1



The supply voltage has to be turned on. The adjustment is carried out on the AM-I-HZ (D07401) board. Two cuvettes (2), which are filled with approx. 200 µl water, are placed into the incubation channel (1) (see Pic. 8.3.5.1).

The theoretical value of the heating is adjusted with the potentiometer ***R22.*** As long as the LED V1 is lit, the heating is active and the temperature increases. The temperature in the cuvettes should be at 37.5°C ± 0.3°C.

5.4

The actual temperature in the cuvettes can be measured with the liquid thermometer.

1↱ = approx. - 1°C / **1**↰ = approx. + 1°C

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.3.6 Adjusting the PC Temperature Display

The current temperature of the measuring unit can be queried with the ***service program***.

11.3

The displayed value is matched to the adjusted value (value displayed on the thermometers) using the potentiometer ***R23.***

1↱ = approx. + 0.5°C / **1**↰ = approx. - 0.5°C

IMPORTANT!
The temperature displayed on the PC in the service program should always be equal to the true temperature!

8.3.7 Checking the Lifting Solenoids

Before aligning the cuvette magazine the function of the lifting solenoids should be checked (stop pins for the 1st cuvette box).

The lifting solenoids (stop pins for the positioning of the 1st cuvette box) can be “extended” or “retracted” with the service program.

11.3

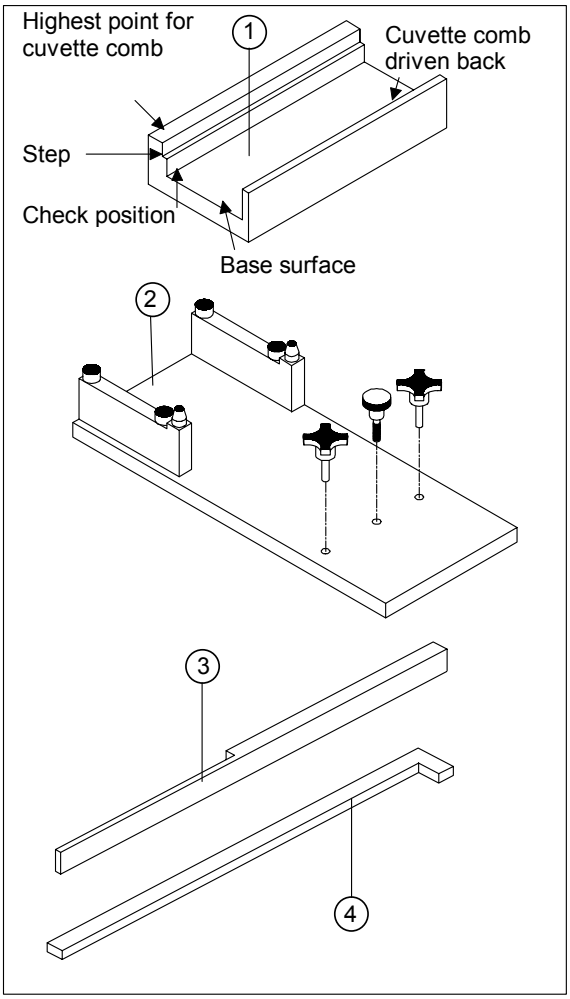
In the retracted position, the pins have to be sunk completely so that the cuvette boxes can be transported over them without hitting them.
”Extension“ of both pins should happen at the same time if possible so that accurate positioning of the cuvette box can be guaranteed. In addition, the lifting solenoids pins should be positioned in the center of the “conveyor 1” plate borings. Should one of the steps not be carried out correctly, the lifting solenoids have to be checked and realigned if necessary.

IMPORTANT!
The lifting solenoids should not be turned on for longer than 30 sec!

ATTENTION!
Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

8.3.8 Alignment Tools Magazine

Pic. 8.3.8.1



(1)
Alignment gauge I (J01847)
(magazine light barriers)

(2)
Alignment gauge (J01820)
(Alignment Pusher Unit 1)

(3)
Alignment gauge III (J01819)
(gauge lifting solenoid)

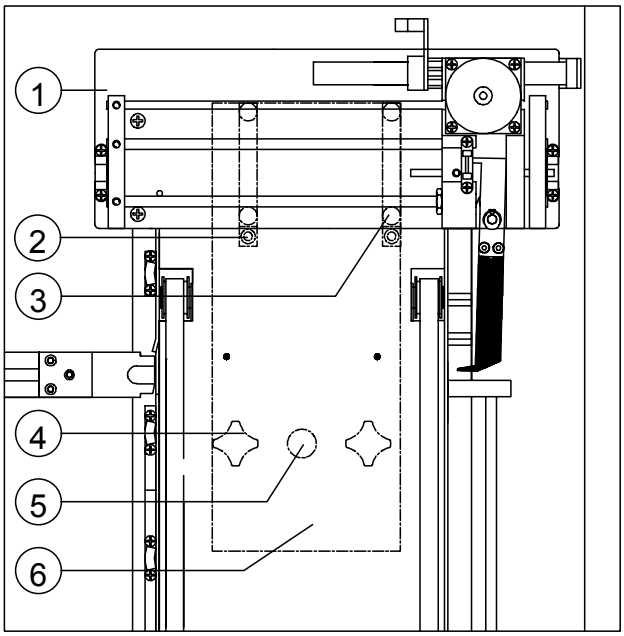
(4)
Alignment gauge II (J01827)
(light barrier for row pusher end position)

IMPORTANT!
All alignment gauges have to be removed after the alignment!

8.3.9 Adjusting the Pusher 1 Unit

The alignment of the Pusher Unit 1 can be checked after inserting the alignment gauge (6) (J01820) and attaching it with the centering pins (4) and the fastening screw (5). The base plate of Pusher Unit 1(1) should lie on the alignment gauge support points and the whole unit should fit closely to the alignment gauge impeders (2)
In order to carry out the alignment, the four M4 nuts have to be unscrewed so that moving the unit is possible.
After completing the alignment, tighten the nuts and remove the alignment gauge.

Pic. 8.3.9.1



ATTENTION!
Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

8.3.10 Alignment of the Cuvette Magazine in the AMAX CS-190

The alignment of the complete magazine can be carried out only when the incubation rail (Q10005) has already been mounted to the instrument. The incubation rail has to be mounted as far as possible in the direction of the amplifier unit and the cuvette magazine. Now the alignment gauge (J01819) (gauge III, alignment gauge lifting solenoid) can be inserted into the incubation rail. The cuvette magazine can be moved after unscrewing the fastening screws (3 hexagonal headed screws). The cuvette magazine is now adjusted so that both lifting solenoids (impeders for the 1st cuvette box) fit closely in front of the alignment gauge. At the same time Ensurethat the incubation rail gauge III of the does not protrude into the cuvette magazine. For example, if a ruler or the alignment gauge II is put against the inside of the cuvette magazine's left side, the incubation rail gauge III may extend no further than the ruler or the gauge II.

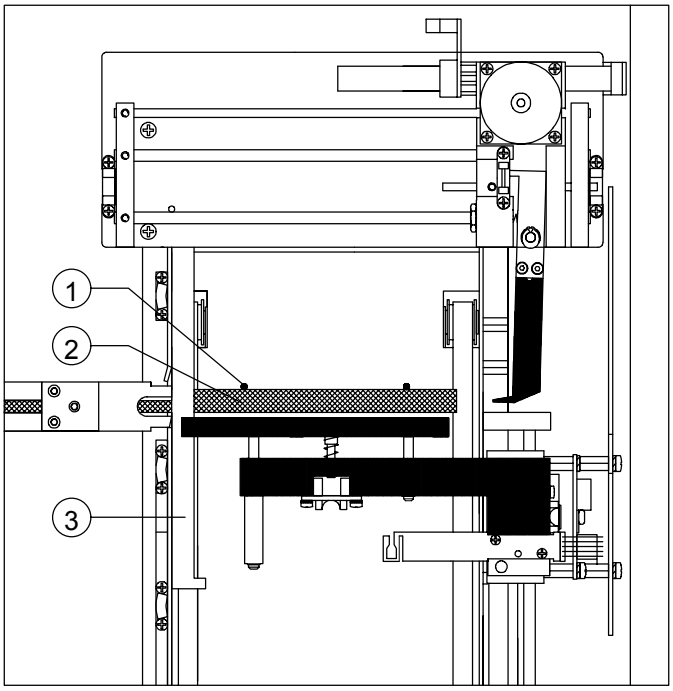
After completing the alignment, both fastening screws have to be tightened again. Perform a function check by pushing the lifting solenoids downwards and releasing them again. They should spring back from the alignment gauge without any delay.

Pic. 8.3.10.1

Lifting solenoids (1)

Alignment gauge III (2)

Alignment gauge II (3)



Alignment check: The row pusher is moved in the direction of the incubation rail.The pusher should be positioned in the middle of the incubation rail opening.

When processing the cuvettes, these should move into the incubation rail in a straight line. The opening in the cuvette box should be in alignment with the opening in the incubation rail.

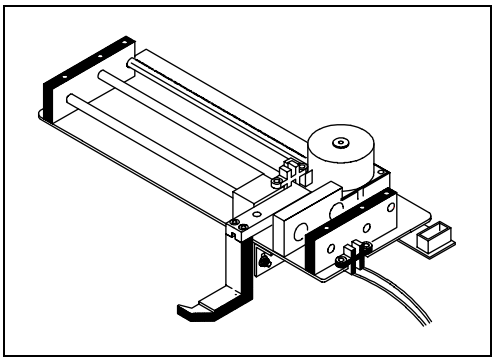
8.3.11 Adjusting the Light Barriers and the Cuvette Comb

The alignments for the light barriers are listed in tab. 8.3.11.1.

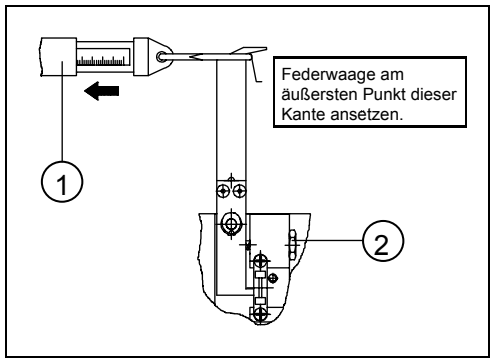
Tab. 8.3.11.1

Light barrier	Position	Alignment
Row pusher see Pic. 8.3.11.1(3)	End	Insert the alignment gauge (J01827) (gauge II, row pusher end light barrier). Gauge II is inserted to the incubation rail end. The light barrier may change its signal (display “High”) only when the row pusher touches the alignment gauge II. The alignment can be altered by moving the straight pin (2). For this purpose, the set-screw (M4) (3) in the motor block (1) has to be loosened.
  see Pic. 8.3.11.1(2)	Tension	A value of 4N is adjusted with the help of a spring scale (1) (890300). For this purpose, the spring scale has to be attached to the tip of the row pusher. Now hold the pusher 1 in its position while pulling on the spring scale until the desired value is archived. The display of the light barrier has to change then. If it doesn’t, the elastic force has to be adjusted with the screw (2) “stop pin”.

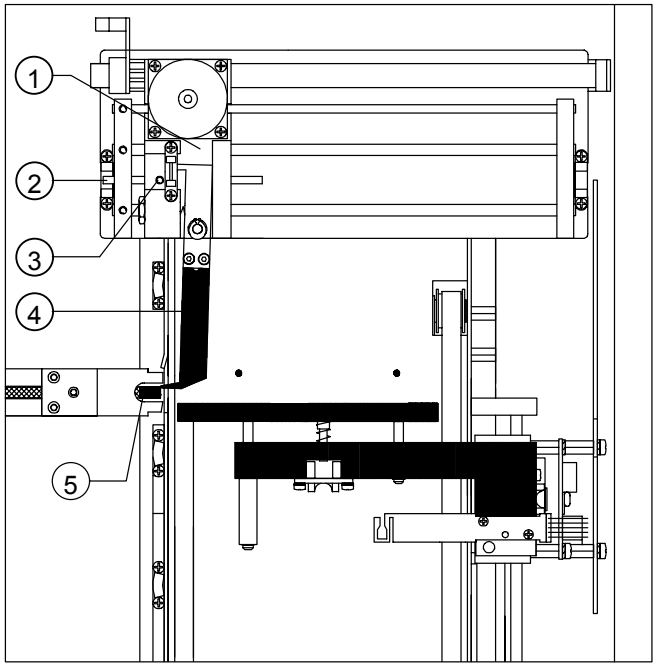
Pic. 8.3.11.1



Pic. 8.3.11.2



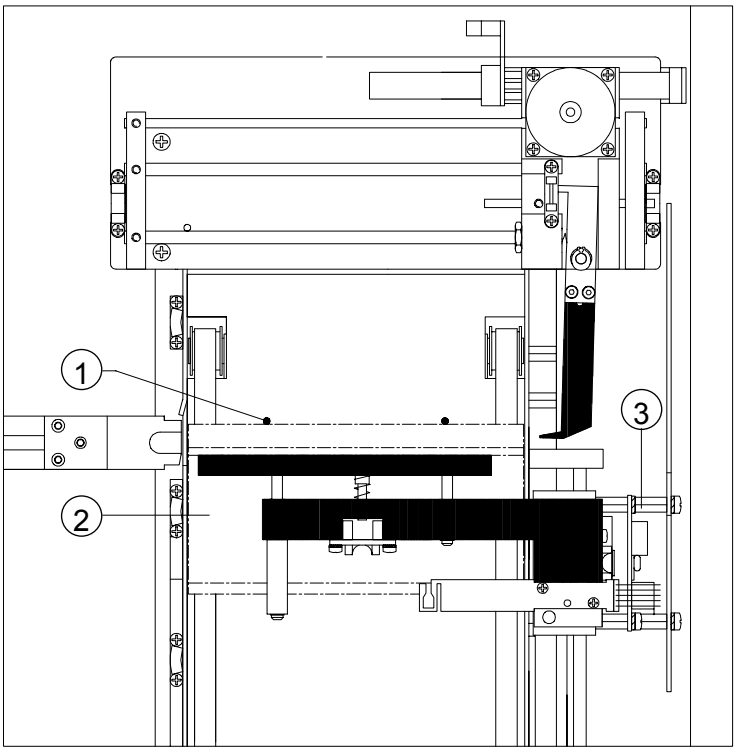
Pic. 8.3.11.3



Motor block	(1)
Straight pin	(2)
Set screw	(3)
Row pusher	(4)
Alignment gauge II (row pusher end light barrier)	(5)

8.3.12 Adjusting the Cuvette Comb

Pic. 8.3.12.1

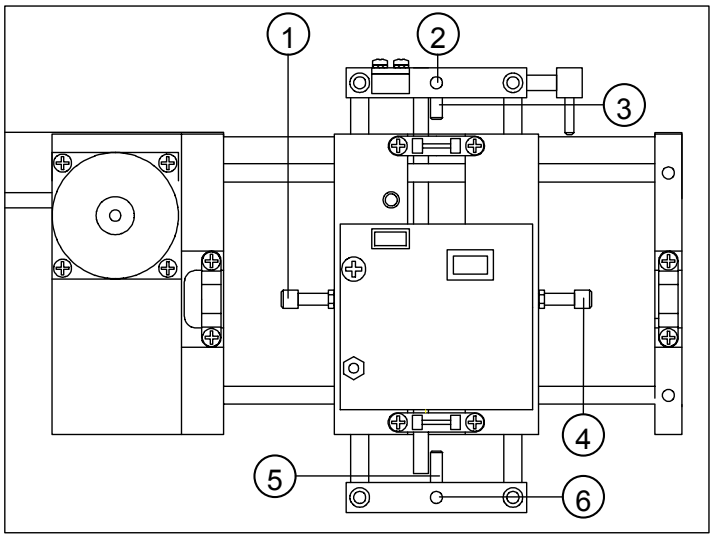


Lifting solenoids (1)

Alignment gauge I (2)
(magazine light barriers)

Pusher 2 unit (3)

Pic. 8.3.12.2 Pusher 2 unit (D10033)



Straight pin (1)
Alignment: Cuvette comb moved backwards

Set-screw (2)

Set-screw (3)
Alignment: Cuvette comb moved downwards

Straight pin (4)
Alignment: Cuvette comb moved backwards

Set-screw (5)
Alignment: Cuvette comb moved upwards

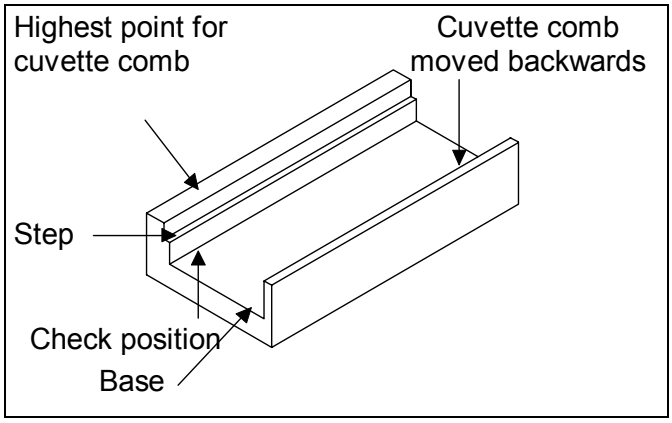
Set-screw (6)

Tab. 8.3.12.1

Light barrier	Position	Alignment
Cuvette comb see Pic. 8.3.12.1 8.3.12.2	moved upwards	Insert the alignment gauge (J01847) (gauge I, magazine light barriers). Pic. 8.3.12.1 The cuvette comb “guide pins” have to be positioned on the highest point (front edge) of the alignment gauge. Only then the signal for the light barrier (Display “Low”) may change. The height of the cuvette comb is adjusted with the set-screw (5) seated in the reset bracket. The set-screw (6) has to be unscrewed first. When the screw (5) is loosened, the position is lowered. When the screw (5) is tightened, the position is raised.
see Pic. 8.3.12.3	moved downwards	The alignment is defined by the base of gauge I. That means that the light barrier may change its signal (display “Low”) only when the “guide pins” are positioned on the base. The stepper motor switch off position can be adjusted with the set-screw (3). The set-screw (2) must be unscrewed first.

Alignment gauge I (J01847)
(Magazine light barriers)

Pic. 8.3.12.3



Continuation Tab. 8.3.12.1

Light barrier	Position	Alignment
see Pic. 8.3.12.3	moved backwards	This position is used when the cuvette box is changed. The comb must be in the position “Comb moved backwards”. The alignment gauge 1 may not be moved from its original position. The position is aligned with the fillister head screw seated in motor block 1 of pusher unit 2.
see Pic. 8.3.12.3	in back position	The cuvette comb “guide pins” have to be positioned on the alignment gauge step. The light barrier signal (display “Low”) the must change when the comb is pushed against the step. The position is aligned with the fillister head screw seated in motor block 1 of the pusher 2 unit.

Check: The check position of the alignment gauge is calculated so that when the comb is in the “Comb moved backwards” position, the light barriers “Comb moved backwards” and “Comb under tension” change their signal (display “Low”) at the same time. Ensure to smooth running of the spring tension beam.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.3.13 Checking the Reflex Light Barriers

Three reflex light barriers are positioned at the left side of the cuvette magazine (user position in front of the instrument). These light barriers monitor the cuvette boxes on the conveyors.
The function check can be carried out with the ***service program***.

11.3

A cuvette box is positioned in front of a single light barrier. The corresponding display in the ***service program*** has to change its status. The reflex light barrier “magazine jam disposal” is positioned in the lower part of the cuvette magazine (disposal chute). Ensure correct allocation of the light barriers.

1. Light barrier “Magazine supply“
2. Light barrier “Magazine front“
3. Light barrier “Magazine jam disposal”

8.3.14 Checking the Conveyors

The conveyors can be turned on and off with the ***service program***.

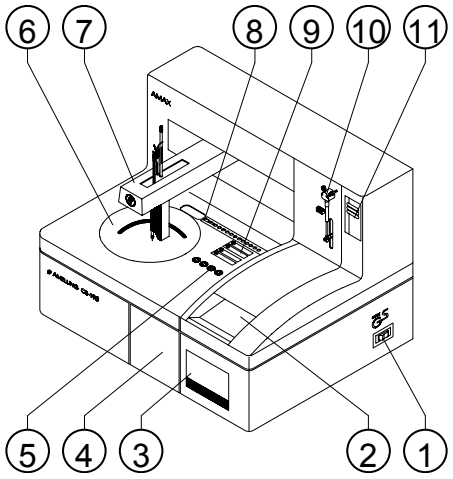
11.3

Ensure that the supply and the disposal conveyor belts are moving in the correct direction. When the conveyors are operating, a “clean”, ”smooth” running noise should be audible. Otherwise, check the tension of each conveyor belt and adjust it if necessary. The driving tapered cogwheels must intermesh perfectly, correct if necessary. The tapered cogwheels must be lubricated.

IMPORTANT!
The conveyors should not be turned on for longer than 30 sec.

ATTENTION!
Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

8.4 Reagent-Plasma-Barcode



Pic. 8.4.1
RPB (6)

Tab. 8.4.1 Structure RPB (Q10004)

electronic subassemblies	
AM-RPB board	(D01101)
PH-MCK II board	(D03601)
PH-TF board	(D08501)
Cover sensor comp.	(Q90022)

There is a dip-switch for adjusting the module address on the PH-MCK board. It also contains the program-IC (integrated chip) IC1, which can be replaced to update to a new program version.
The following dip-switch adjustments have to be carried out so that the module can be identified.

Tab. 8.4.2

Dip-switch S1	Position
Switch no. 1	off
Switch no. 2	on
Switch no. 3	on
Switch no. 4	off
Module address: 6	

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.4.1 Adjusting the Cooling Circuits

IMPORTANT!
This adjustment may be carried out only when the instrument is switched on, that means only when the cooling circuit is working

In order to carry out the adjustment, the following instrument casings have to be removed:

Side casing left	**(123289)**
Front plate left	**(123293)**

The adjustment is carried out on the PH-R2R (D06101) board. The actual temperature value of the cooling is adjusted with potentiometer ***P1.***

1↱ = approx. - 1.0°C / **1**↰ = approx. + 1.0°C

The cooling is active and the temperature decreases as long as the LED V3 is lit. The actual temperature is measured with a contact thermometer on the aluminium-block.

When the LED V3 has gone out, the temperature should be at 16.5°C ± 1.5°C.

5.4

ATTENTION!
Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

8.4.2 Adjusting the PC Temperature Display

The adjustment is carried out on the PH-TF (D06801) board. The actual temperature of the measuring block can be queried with the ***service program.***

11.4

The displayed value can be altered (adjusted) with the potentiometer ***R7.***

1↱ = approx. - 0.5°C / **1**↰ = approx. + 0.5°C

The temperature of the side surface of the aluminium-ring should be measured with a contact thermometer. Then it should be adjusted to this value: ca. 16.5°C.

IMPORTANT!
The temperature displayed by the PC in the service program should always be equivalent to the actual temperature.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.4.3 Adjusting the Cutoff Voltage of the Servo Power Amplifier

In order to carry out the adjustment, the following instrument casings have to be removed:

Side casing left (123289)

The voltage is measured at PIN 2 of IC 7 (IC LM 311) on the AM-RPB (D00301) board against ground with a multimeter. A voltage of approx. 1.1 volts is adjusted with the potentiometer ***R19.***

1↱ = approx. + 200mV / **1**↰ = approx. - 200mV

In order to make a function check, the rotor is moved manually. Resistance can be felt and the operating noise of the motor becomes audible. When the pressure is increased, the rotor movement must be effortless.
The cutoff has been activated. The LED V5 has gone out and the relay REL1 has opened.

The adjustment can be checked in the ***service program*** by running the test routine for the reagent-plasma-tray (the connection: Reagent-plasma-tray and commander PC must be established).

11.4

Here, the cutoff must not activated, otherwise the voltage at PIN 2 of IC 7 must be increased.

8.4.4 Adjusting the Mixer Voltage

The measured and adjusted voltage is proportional to the mixer voltage. Therefore the voltage is measured at PIN 15 of IC 10 (L297) with a digital multimeter. The voltage value is adjusted to a max. of 0.200 volts with potentiometer ***R24.***

1↱ = + 120mV / **1**↰ = - 120mV

To check the mixer vials each containing a magnetic flea is placed in the reagent tray on positions 9, 17 and 18. The magnetic flea must rotate on all a.m. positions.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.4.5 Mechanical Reset Adjustments at the RPB

In order to carry out the adjustments, the instrument must be switched on and connected to the commander PC.

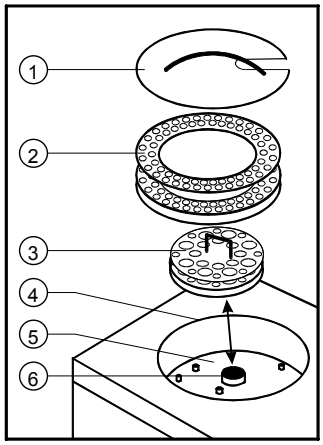
7.5

The reset position must be adjusted so that the indent at rotor (2) (plasma ring) coincides with the indent of the ALU-ring (4) (cooling) after the reset operation.

First the reagent tray (3) is taken out of the reagent-plasma-cavity in order to unscrew the set-screws which are screwed into the core (6). Now the tray (5) can be turned on its axis so that the position can be changed. After each change, the set-screws have to be tightened again. The reagent plasma tray must carry out a reset so the new reset position will be obtained.

When the indents coincide, the adjustment is complete.

Pic. 8.4.5.1



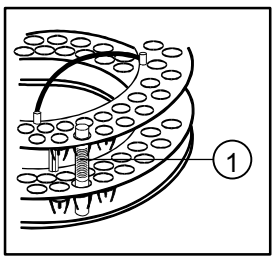
8.4.6 Adjusting the Barcode Scanner Position

The lateral position of the barcode scanner can be altered by loosing the plate angle fastening screws. The scanner can now be positioned facing or opposing the ALU-ring after the barcode scanner fastening screws have been unscrewed.

A scanning operation can be started with the ***service program.*** Position a monovette in the outer plasma ring. The position of the scanner has to be adjusted so that the laser beam moves centrally across the monovette (1). The operation then has to be repeated, this time with a monovette in the second plasma ring.

11.4

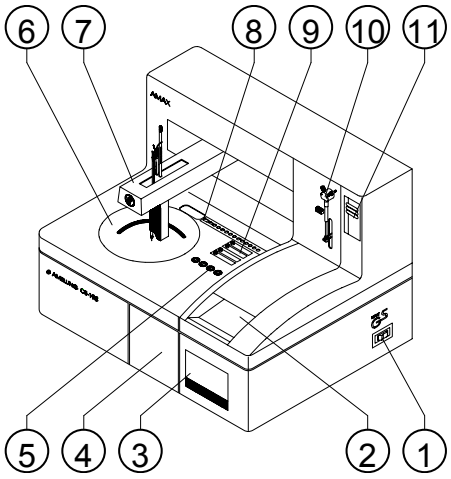
Pic. 8.4.6.1



Finally, a monovette with a barcode label is placed in the plasma ring and a new scanning operation is started. When the barcode is read successfully, the adjustment is complete. The screws have to be tightened again.

ATTENTION!
Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

8.5 Photometer



Pic. 8.5.1
Photometer (9)

Tab. 8.5.1 Structure photometer (Q10010)

mechanical subassemblies	
Amplifier	(Q10050)
Lamp casing	(D10085)
Measuring unit	(D10087)
Light voltage regulator	(Q10015)

The module address is adjusted on the PH-O-RK board. It is positioned in the subassembly: computer board unit (Q10082).

There are two dip-switches for adjusting the module adress on the PH-O-RK board. It also holds the program-IC (integrated chip) IC1, which can be replaced to update to a new program version.

The following dip-switch adjustments have to be carried out so that the module can be identified:

Tab. 8.5.2

Dip-switch S1	Position	Dip-switch S2	Position
switch no. 1	on	switch no. 1	off
switch no. 2	on	switch no. 2	off
switch no. 3	on	switch no. 3	off
switch no. 4	off	switch no. 4	off
Module address: 7			

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.5.1 Removing the Measuring Unit

In order to remove the measuring unit, the following instrument casings have to be removed:

Upper structure	**(123290)**
Side casing left	**(123289)**
Work area	**(123292)**
Front plate left	**(123293)**
Side casing right	**(123291)**
Front plate right	**(123294)**
Magazine cover	**(122432)**

8.5.2 Adjusting the Temperature of each Measuring Channel

In order to carry out the adjustments, the following instrument casings have to be removed:

Upper structure	**(123290)**
Side casing left	**(123289)**
Work area	**(123292)**

Adjustment is carried out on the PH-O-HZ (D06501) board which is mounted on every measuring channel. A cuvette filled with 200 µl water is placed into each photometer measuring channel. The supply voltage must be switched on. The adjustment can be carried out outside of the instrument as well. Pay attention that the photometer is not surrounded with cold air (avoid draft). The actual temperature value of the heating is adjusted with the potentiometer ***R1*** (accessible through the upper plate of the photometer).

1↱ = approx. + 1°C / **1**↰ = approx. - 1°C

The heating is active and the temperature increases as long as the light emitting diode LED V1 (cannot always be seen) is lit. The actual temperature can be measured in the cuvette with the liquid thermometer.

When LED V1 has gone out (after approx. 15 minutes), the temperature should be at 37.5°C ± 0.3°C.

5.4

After each change of the actual value wait at least 5 minutes before reading the actual value.

The adjustment process is complete as soon as the temperature in the cuvette is constant.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.5.3 Adjusting the Photometer Lamp Voltage

In order to carry out the adjustment, the following instrument casings have to be removed:

Side casing left **(123289)**

The lamp is switched on with the ***service program***.

11.5

The lamp voltage is adjusted on the AM-O-LSR (D08401) board with potentiometer R***50.***

1↱ = approx. - 200mV / **1**↰ = approx. + 200mV

The voltage to be adjusted can be measured at the points X5 & X6 (lamp cable connection) with a digital multimeter. The voltage should be 11.0 ± 0.5 volts.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.5.4 Adjusting the Photometer Measuring Amplifier

In order to carry out the adjustment, the following instrument casings have to be removed:

Upper structure **(123290)**
Side casing left **(123289)**
Working area **(123292)**

The calibration should be carried out inside the instrument (photometer installed). The measuring unit has to be protected from outside light sources. The disposal drawer has to be closed. The temperature and the lamp voltage have to be adjusted correctly. Otherwise the temperature and voltage adjustment of the photometer lamp have to be carried out first.

The AMAX CS-190 has to be connected to the commander PC.

7.5

Offset calibration

The voltages of each measuring amplifier can be queried with the ***service program*** for the photometer. (Amplifier compl. (Q10150)).

11.5

Start the ***service program*** and carry out a reset by pressing **<F10>**, load the program with **<F7>** (Enter: photonp.bin), start the measuring program with **<F9>** and access the displays of the channels with **<F6>-<6>,<7> or <8>.** The parameters are entered.

Base voltage: 0 / Multiplier: 1000

The channels are adjusted with the *offset potentiometer* (lower potentiometer) so that all curves on the screen are positioned between 0.0005 und 0.001 volts (approx. 5-10 digits).

1↱ = approx. + 4.5mV(ca. + 28 Digits) **/ 1**↰ = approx. - 4.5mV(ca. - 28 Digits)

Amplification calibration

IMPORTANT!
No cuvettes may be positioned in the measuring channel!

Now the photometer lamp is started with ***service program*** for the photometer.

11.5

Press **<F9>** to start the measuring program, then switch on the lamp with **<F4>** and wait 3 minutes, then press **<F6>-<6>,<7> or <8>** to access the displays of the channels. The parameters are entered.

Base voltage: 8.2 / Multiplier: 100

The channels are adjusted with the *amplifier potentiometer* (upper potentiometer) so that all lines on the screen level out at 8.25 ± 0.1 volts (approx. 54000 digits).

1↱ = approx. + 225mV(ca. + 1800 Digits) **/ 1**↰ = approx. - 225mV(ca. - 1800 Digits)

IMPORTANT!
If this value cannot be adjusted, that means when the range between high and low is too small, the following steps have to be carried out:

1. When the values are too low, first clean the photmeter measuring channels. When no change can be determined,

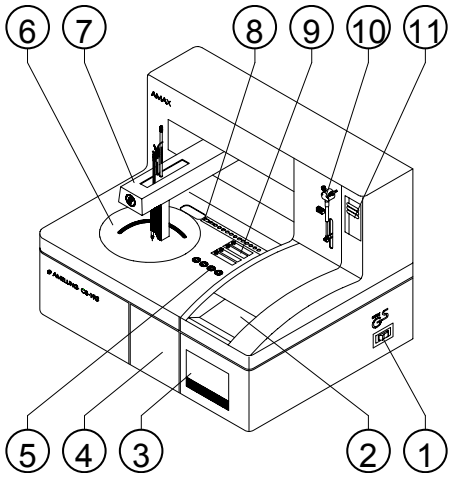
alter the lamp voltage (increase).
2. When the values are too high, decrease the lamp voltage.

In the ***service program*** the adjustment is displayed with a graphic.

11.5

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.6 XYZZ-Robot (gantry)



Pic. 8.6.1
XYZZ-robot (7)
(gantry)

Tab. 8.6.1 Structure XYZZ-robot (gantry) (Q10009)

mechanical subassemblies		electronic subassemblies	
Motor block	(D10020)	PH-X-ADA2 board	(D01302)
Ball bearing mounting	(Q10031)	PH-RC board	(D01401)
End ball bearing	(D10021)		
Needle heating	(D10044)		

The PH-MCK II board sits on the PH-XYZZ board, which is mounted to the plate: board unit XYZZ-AM-F2 (Q10085).
There is a dip-switch for adjusting the module address on the PH-MCK II board. It also holds the program-IC (integrated chip) IC1, which can be replaced to update to a new program version.
The following dip-switch adjustments have to be carried out so that the module can be identified:

Tab. 8.6.2

Dip-switch S1	Position
switch no. 1	off
switch no. 2	off
switch no. 3	off
switch no. 4	on
Module address: 8	

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.6.1 Adjusting the Safety Systems of the Control Unit

In order to carry out the adjustment, the following instrument casing has to be removed:

Rear casing (123268)

In order to carry out the adjustment, the instrument has to be switched on and connected to the commander PC.

7.5

IMPORTANT!
There are multiple safety systems for the robot gantry on the PH-XYZZ (D00101) board. These safety systems protect the user from movements of the gantry in case he gets in the way of the robot. This makes it important to carry out the following adjustments with great care.

8.6.2 Voltage Cutoff of the X-Motor Amplifier

The voltage is measured at PIN 5 of IC 20 on the PH-XYZZ board with a multimeter against ground. A voltage of approx.1.53 volts is adjusted with the potentiometer ***R29*** (Imprint on the board: **I-X**).

1↱ = approx. + 200mV / **1**↰ = approx. - 200mV

In order to carry out a function check the robot gantry is manually pushed to the left or the right in X-direction. Resistance can be felt and the operation noise of the motor becomes audible. After pushing harder, the gantry must move effortlessly.

IMPORTANT!
Both Z-axis are powered off as well and might move downwards. This may cause damage!

The safety cutoff has activated, the robot gantry has been powered off. The light emitting diode (LED) V21 has gone out on the PH-XYZZ board and the relay has opened.

Now switch the instrument off and on (resets the cutoff system).

ATTENTION!
Do not switch the instrument on and off in short sequence (wait approx. 10-15 seconds).

Disregard can lead to malfunction of and cause damage to the

AMAX CS-190!

8.6.3 Voltage Cutoff of the Y-Amplifier

The voltage is measured at PIN 9 of IC 20 on the PH-XYZZ board with a digital multimeter against ground. A voltage of approx. 0.75 volts is adjusted with the potentiometer ***R58*** (Imprint on the board: **I-Y**).

1↱ = approx. + 200mV / **1**↰ = approx. - 200mV

In order to carry out a function check the robot gantry is manually pushed in Y-direction. Resistance can be felt and the operation noise of the motor becomes audible. After pushing harder, the gantry must be moved effortlessly.

IMPORTANT!
Both Z-axis are also powered off and might move downwards.
This may cause damage!

The safety cutoff has activated, the robot gantry has been powered off. The light emitting diode (LED) V21 has gone out on the PH-XYZZ board and the relay has opened.
Now switch the instrument off and on (resets the cutoff system).

ATTENTION!
Do not switch the instrument on and off in short sequence (wait approx. 10-15 seconds).

Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

8.6.4 Speed Cutoff of the X-Motor Amplifier

The voltage is measured at PIN 7 of IC 20 on the PH-XYZZ board with a digital multimeter against ground. A voltage of approx. 1.4 volts is adjusted with the potentiometer ***R57*** (Imprint on the board: **V-X**).

1↱ = approx. + 180mV / **1**↰ = approx. - 180mV

In order to carry out a function check the ***service program*** "XYZZ-robot" has to be accessed and used to power off the robot-axes. The gantry then can be moved effortlessly.

11.6

IMPORTANT!
Both Z-axis are also powered off and might move downwards. This may cause damage!

The robot X-sledge now has to be moved all the way to the left to its reset position.

IMPORTANT!
Both Z-axes have to be positioned at the upper stops.

From the reset position, the sledge is accelerated manually as fast as possible. When it reaches a certain speed, the amplifier switches off. The light emitting diode (LED) V21 on the PH-XYZZ board has gone out and the relay has opened.

Now switch the instrument off and on (resets the cutoff system).

ATTENTION!
Do not switch the instrument on and off in short sequence (wait approx. 10-15 seconds).

Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

In order to carry out a function check of the XYZZ-robot after the adjustments, a test routine (in the ***service program*** "Test routine XYZZ-axes") or a self test has to be run.

11.6
11.14

IMPORTANT!
Should the gantry turn itself off during normal movement, the adjustment is over-sensitive. The adjustment has to be corrected. Also check the guide rails for sluggishness and lubricate them if necessary.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

8.6.5 Mechanical Reset Adjustment of the XYZZ-Robot

When the operating voltage is turned on, the robot moves to its reference position. All XYZZ-units have to move: The Z-axes move to the upper stops in sequence, then the Y-unit moves into the light barrier, then the X-motor starts moving. As soon as it has also reached its light barrier, all motors simultaneously start moving abruptly in order to check the belts' tension. Then all axes move back to their reference positions until the XYZZ-gantry comes to a stop over the incubation rail. This also is the home position.

Should the XYZZ-robot not come to a stop there, there are several possible reasons:

Light barrier(s) defect, safety cutoff has activated, belts torn, reset light barrier recognition not adjusted, etc.

Example: Only one sledge moves, e.g. both axes move to the upper stops and then the Y-axis moves into its light barrier.
Then nothing moves any more, the next unit should then be checked (X-motor).

ATTENTION!
Do not switch the instrument on and off in short sequence (wait approx. 10-15 seconds).

Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

In order to carry out the following adjustments, the following instrument casings have to be removed:

Casing Y-gantry	**(122579)**
Rear casing	**(123268)**

The voltage supply unit has to be tilted upwards and secured.

8.6.6 Adjusting the XY-Motors

The mechanical adjustment position of the XYZZ-robot is mechanical measuring channel 4.

Ball position 4 with the cuvette ejector is obtained using the ***service program***.

11.6

IMPORTANT!
The XY-positions of the Z-axes should be about right before the adjustment. If they are not, the Z2-axis may touch the rim of the measuring channel. The cutoff of the Z-motors could be activated.

In order to adjust the X-position, the screw on the clip “light barrier” on the X-sledge (Q10008) is unscrewed. With it, the X-position is altered.

In order to adjust the Y-position, the screw on the clip “light barrier adjustment” on the ball bearing mounting (Y-axis) (Q10031) is unscrewed. The position can be altered by moving the metal flag.

Tighten the screws after each change.

Use the ***service program*** to carry out a reset of the XYZZ-robot and then obtain the position again.

11.6

If the ejector reaches position 4 successfully, the XY-motor adjustment is complete.

When all motors (sledges) are at their reference positions the “Teach in” must be checked.

11.10

IMPORTANT!
After each light barrier adjustment, the robot must move back to its reference position. Otherwise, the altered adjustment is not effective.

ATTENTION!
Do not switch the instrument on and off in short sequence (wait approx. 10-15 seconds).

Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

8.6.7 Adjusting the Level Sensors (liquid level sensors and height sensors)

The PH-LSX board is positioned at the side wall of the subassembly: Dilutor-unit (Q10007)

In order to carry out the adjustment, the following instrument casings have to be removed:

Upper structure	**(123290)**
Shield plate	**(123203)**

1. Solder bridge X1using a soldering iron and solder. The amplitude of the HF-oscillator is checked by connecting the oscilloscope to the measuring point MP1 and earth. The oscillator is adjusted to a default amplitude of 4Vss with the potentiometer *R33.*

↱ = - / ↰ = +

2. Adjusting the amplitude of both Z-axes:
The oscilloscope is connected to PIN X5 or X7. An amplitude of 600mVss is adjusted with the potentiometer R31.

↱ = - / ↰ = +

3. Adjusting the input amplitude (remaining circuit):
A digital multimeter is connected to MP 4 and a voltage of 3 volts ± 0.1V is adjusted.

↱ = - / ↰ = +

The circuit is now operational. A voltage of approx. 700mVss can be measured with the oscilloscope at the measuring point MP2 after a successful adjustment. At MP3, approx. 3.5Vss can be measured. In order to check it, touch the Z-axis with your fingers. Then LED V9 should light up.

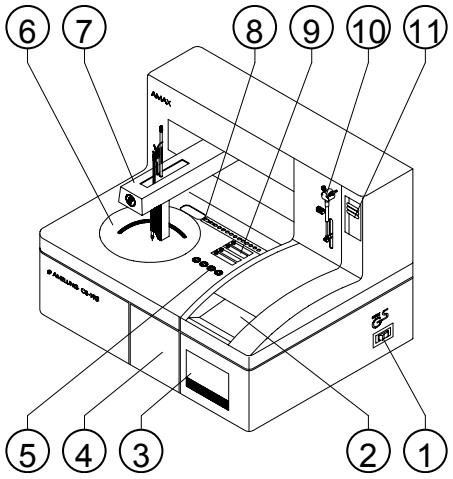
The sensors can also be checked with the ***service program***.

11.6

ATTENTION!
Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

8.7 Water Temperatures

Pic. 8.7.1



Tab. 8.7.1 Structure water tempering (Q10013)

mechanical subassemblies		electronic subassemblies	
water reservoirs II	(D10068)	PH-H2O board PH-MCK board	(D00901) (D00801)

There is a dip-switch for adjusting the module address on the PH-MCK board. It also contains the program-IC (integrated chip) IC1, which can be replaced to update to a new program version.
The following dip-switch adjustments have to be carried out so that the module can be identified:

Tab. 8.7.2

Dip-switch S1	Position
switch no. 1	on
switch no. 2	off
switch no. 3	off
switch no. 4	on
Module address: 9	

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

In order to carry out the following adjustments, the following instrument casings have to be removed:

Rear casing **(123268)**

8.7.1 Adjusting the Water Reservoir II Temperature (D10068)

The theoretical value of the heating is adjusted with the potentiometer ***R16*** on the PH-I-HZ II (D01101) board which sits under the water reservoir.

1↱ = approx. - 1.0°C / **1**↰ = approx. + 1.0°C

The heating is active and the temperature increases as long as the LED V1 is lit. The temperature of the reservoir has to be 41°C ± 0.5°C.

5.4

The temperature of the reservoir is measured with a contact thermometer on the brass plate (base plate of the reservoir).

8.7.2 Adjusting the PC Temperature Display

The adjustment is carried out on the PH-TF (D06801) board which is mounted under the water reservoir II.

The actual temperature of the water reservoir II can be queried with the ***service program.***

11.7

The displayed value is altered (adjusted) with the potentiometer ***R7.***

1↱ = approx. - 0.5°C / **1**↰ = approx. + 0.5°C

The temperature is measured with a contact thermometer on the brass plate (base plate of the reservoir). Then the measured value is adjusted.

IMPORTANT!
The temperature displayed by the PC in the service program should always be equivalent to the actual temperature.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

9. Maintenance

9.1		Refilling the System Fluids	9 – 1
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9.8		Cuvette Waste Drawer	9 – 11

9.1 Refilling the System Fluids

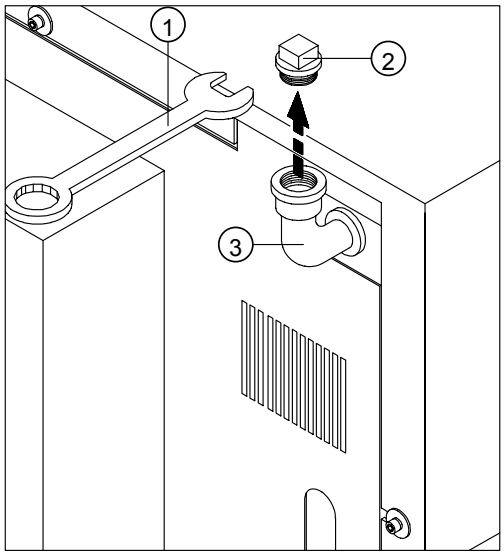
The AMAX CS-190 features two fluid circuits, each containing a system fluid. There is a cooling circuit and a 37°C circuit. The fluid is stored in a central storage reservoir. The software monitors the fluid level in the reservoir. In case of a fluid deficiency, a message will be displayed on the screen.

The filling neck is positioned on the top left corner of the rear of the instrument (assuming user is located in front of the instrument).

Lacking system fluid is refilled as follows:

IMPORTANT!
The AMAX CS-190 should be switched off and at the same time be up to operating temperature.

Pic. 9.1.1



1. Switch off instrument
2. Open filling neck (3)
   (loosen screw (2) with an open jaw spanner (1) size 13mm and remove it)
3. Refill system fluid
   (830040) 500ml bottle
   Refill the system fluid using a funnel.
   Pour in Fluid until it becomes visible in the bend of the filling neck (3)
4. Close filler neck (3)

The system fluid levels can also be monitored by the ***service software***.

11.7

ATTENTION!
Spilled fluid is to be removed immediately.
Disregard may lead to malfunction of and cause damage to the AMAX CS-190!

9.2 Cleaning the Air Filter

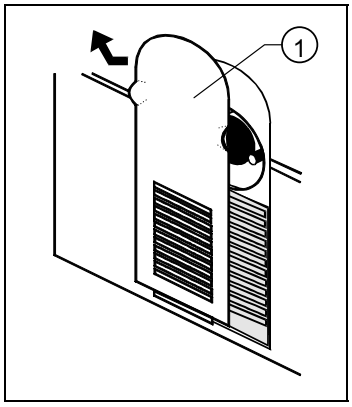
The air filter removes dirt particles from the air passing through the air intake. If the filter element is polluted by dust particles, the cooling air flow rate will be insufficient. This makes it necessary to clean the filter once every week.

The filter element is positioned on the left side of the instrument (user's location in front of the instrument) and behind the ventilation sheet metal.

In order to reach the air filter (filter fabric (120396)), the following steps have to be carried out:

1. Switch off instrument

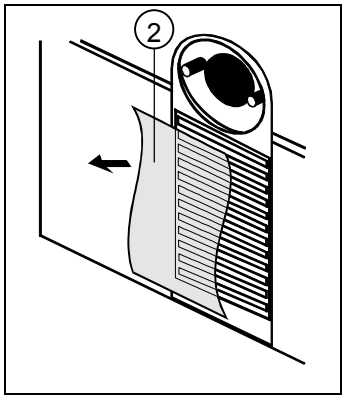
Pic. 9.2.1



2. Remove ventilator cover (1)

Pic. 9.2.2

3. Remove air filter (2)



Now the filter can be patted clean. In case of major pollution it should be washed out. After the washing, insert dry filter.

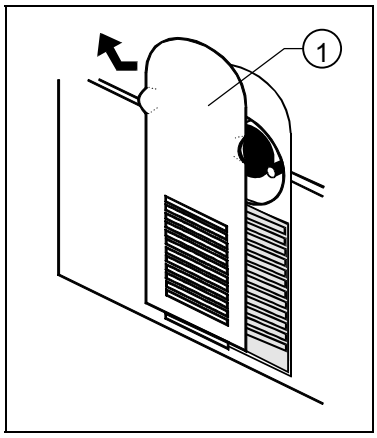
ATTENTION!
Disregard may lead to malfunction of and cause damage to the AMAX CS-190!

9.3 Replacing the Photometer Lamp

The photometer lamp (247410) is positioned on the left side of the instrument (user's location in front of the instrument), behind the ventilator cover.

9.3.1 Removing the Photometer Lamp

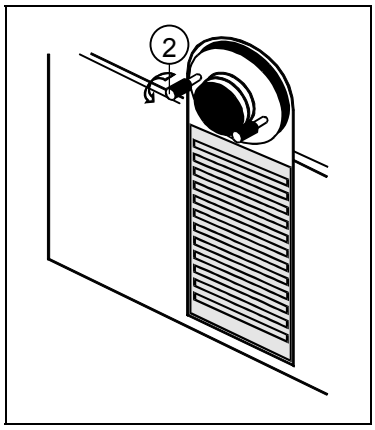
Pic. 9.3.1.1



1. Switch off the instrument

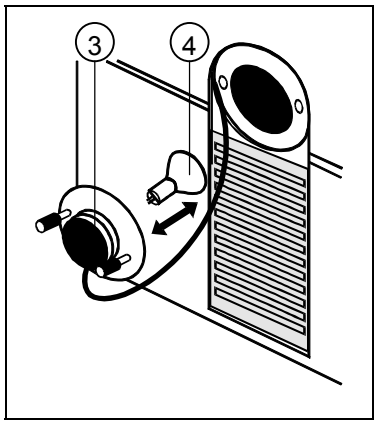
2. Remove ventilator cover (1)

Pic. 9.3.1.2



3. Loosen both knurled screws (2) on the lamp casing cover in anticlockwise direction.

Pic. 9.3.1.3



4. Extract the lampholder (3)

5. Remove the lamp (4) from the lampholder (3):
   Hold the cover with one hand while pulling the lamp out of the lampholder with the other hand.

In order to exchange the lamp, the following steps have to be carried out:

ATTENTION!
Lamp and lamp cover can be hot.
Danger of Burns!

ATTENTION!
Don't pull on the lamp cable!

9.3.2 Inserting a New Lamp

1. Pick up the lamp with a suitable, anti-static rag or cloth and insert the lamp into the holder.
2. Tighten both knurled screws on the lamp casing cover in clockwise direction.
3. Functionality of the photometer can be checked with the ***service program***.
4. In the user software (main menu), select "Service", then "Calibrate photometer".

ATTENTION!
Do not touch the lamp or the inside of the reflector with the fingers. The fingerprints can destroy the lamp.

In case the lamp or the reflector were touched, immediately clean them with pure alcohol.

Only the original type of lamp should be used.

Disregard may lead to malfunction of and cause damage to the AMAX CS-190!

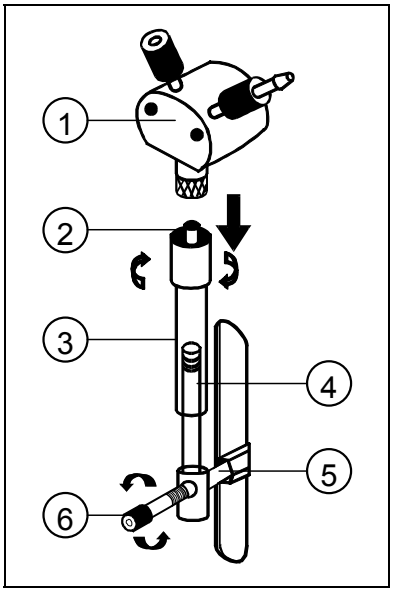
9.4 Dilutor Syringe

9.4.1 Removing the Dilutor Syringe

The dilutor syringe (290007) (500µl) should always be changed or cleaned when leaks occur or bubbles appear in the glass cylinder.

In the user software (main menu), select **"Service"**, then **"Move syringe"**. This will move the dilutor syringe to its lowest position.

Pic. 9.4.1.1



The syringe can now be removed as follows:

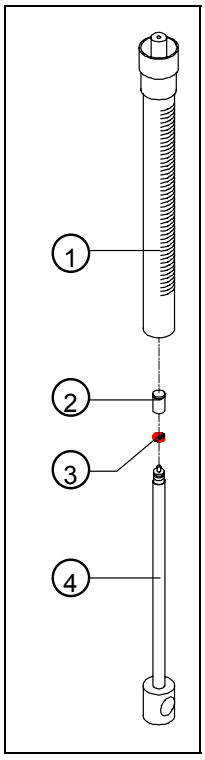
1. Loosen knurled screw (6) in anticlockwise direction.
2. Unscrew syringe cylinder (3) (glass cylinder with threaded tip) in anticlockwise direction off the dilutor head (valve) (1).
3. Remove syringe.

Pull the plunger rod (4) of the syringe out of the glass cylinder (3). Both parts are put into a container filled with distilled water and boiled for 5 - 10 minutes.
Insert the plunger rod (4) back into the glass cylinder (3). To ease movement its sliding, the plunger rod is moistened with water or the cylinder is filled with a little distilled water.

IMPORTANT!
When the plunger was boiled 3 - 5 times, it has to be replaced.
If necessary, the complete syringe has to be replaced.

9.4.2 Replacing the Teflon Seal

Pic. 9.4.2.1



1. Remove old teflon seal (2) by pulling it off the plunger rod (4). Use a pair of pliers.

2. The O-ring (3) also has to be removed.

3. Put a new O-ring (2) (350121) on the plunger rod (4).

4. Slide the new teflon seal (2) (350350) over the O-ring (3) and onto the plunger rod (4). The seal has to be slid onto the plunger rod up to the stoppers.

5. Insert the plunger rod (4) into the glass cylinder.
   Moisten the plunger with a little water or fill the cylinder with a little distilled water.

The installation of the syringe is carried out in the reversed order.
Also see Pic. 9.4.1.1.

ATTENTION!
The plunger must move freely.

⇒ Risk of fracturing the glass cylinder.

The threaded tip (2) (Pic. 9.4.1.1) may only be screwed hand-tight.

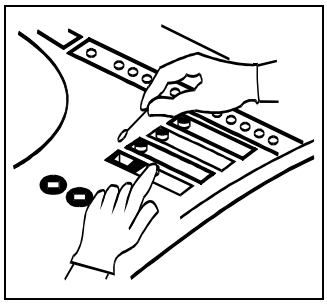
In the user software (main menu), select **"Maintenance"**, then **"Wash"** or **"Fill"**. The dilutor should now be washed until no more bubbles are visible.

ATTENTION!
Disregard may lead to malfunction of and cause damage to the AMAX CS-190!

9.5 Cleaning the Photometer Channels

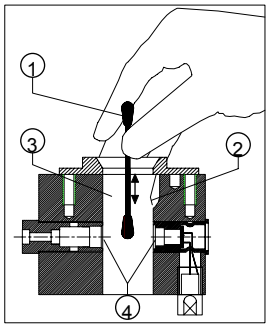
After some time, it is necessary to clean the photometer channels. Deposits on the photometer optics may lead to malfunction.

Pic. 9.5.1



1. Switch off instrument.
2. Open the photometer channel.
3. Clean the photometer optics.
   (see Pic. 9.5.2)

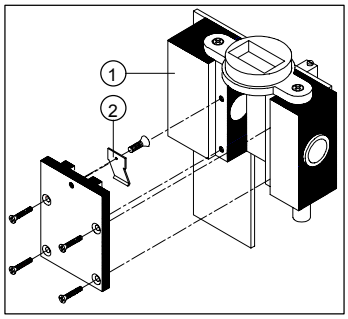
Pic. 9.5.2



Clean the photometer optics (4) in the cuvette shaft using a cotton wool stick (1) soaked with water. Use up- and downwards movements for cleaning.

Cuvette retaining spring (2)

Pic. 9.5.3



Photometer channel (1)

Cuvette retaining spring (2)

ATTENTION!
The cuvette retaining springs (2) in pic. 9.5.2(3) must not be bent.

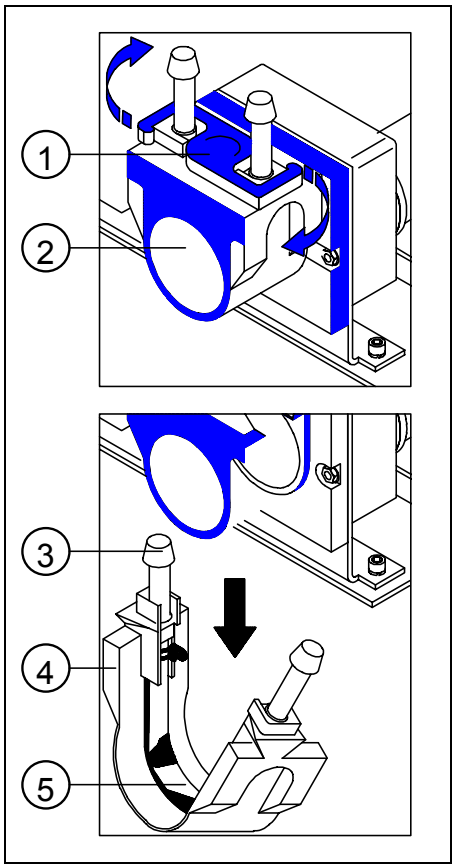
Disregard may lead to malfunction of and cause damage to the AMAX CS-190!

9.6 Pump Tubing, Waste Water Pump

The waste water pump (241050) for the XYZZ-well is a tube pump.
The pump tubing can be replaced as follows:

ATTENTION!
Wear gloves for protection.
Risk of Infection!

Pic. 9.6.1



1. Switch off instrument.
2. Remove back panel (123268).
3. Turn the seal (1) of the waster water pump (2) to the position “**open**”.
4. Take the pump hose unit (4) out of the pump (2).
5. Pull the tubing (5) off the pump tubing connections (3).
6. Take the pump tubing (5) out of the sheath (4).
7. Install the new pump tubing (241051). The installation is carried out in the reverse order.

ATTENTION!
Ensure correct direction of pumping and suction.

Disregard may lead to malfunction of and cause damage to the AMAX CS-190!

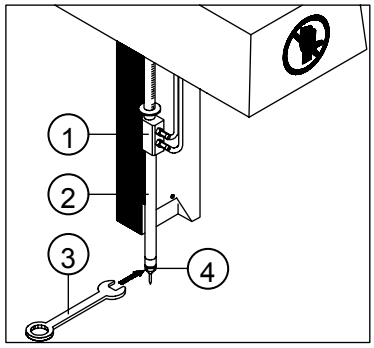
9.7 Needle XYZZ-Robot

The needle has a fine opening which is necessary for the pipetting sequence. The opening was designed to enable good mixing in the cuvette of the reagent with the sample. Occasionally, it can happen that a reagent crystallises out in the needle. In this case, the needle has to be replaced.

ATTENTION!
A clogged needle may influence the measuring results.
Wear gloves for protection.
Risk of Infection!

9.7.1 Replacing the Needle

Pic. 9.7.1.1

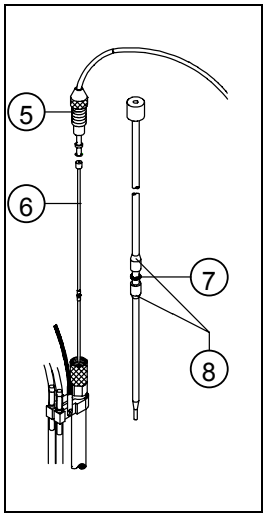


1. Switch off instrument.

2. Loosen the screw (4) of the needle heating (2) with a open jaw spanner (size 5.5) (3).

ATTENTION!
Another open jaw spanner (size 7) should be used to grip the needle heating (1) in order to prevent it from being twisted.

Pic. 9.7.1.2



3. Unscrew the tubing (5) on the top of the Z-Axis.
   Water will flow out of the needle.

4. Push the defective needle (6) out of the heating mantle (1) from below by using the tool (J01818).
   Soak up the leaking system fluid with a rag.
   A O-ring (7) should still be seated on the needle between both rings (8).
   If it isn't, the ring is in the needle heating mantle.
   Remove the O-ring from the heating mantle.
   Otherwise the system fluid flow through might be inhibited.

9.7.2 Installing a New Needle

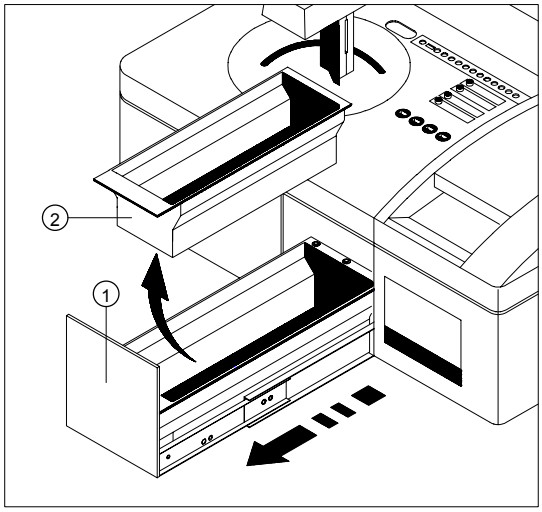
1. Insert the new needle (D10082) (6) carefully into the needle heating mantle (1). Screw the tubing onto the needle.
2. Tighten the screws again.
3. To ensure that the system is air-free, access the user software (main menu), select **"Service"**, then **"Wash"** or **"Prime"**.
4. Check the output jet.

After replacing the needle, the temperature on the needle heating mantle (1) should be checked (finger-test). This test can determine whether or not the flow through of the system fluid is inhibited.

ATTENTION!
Disregard may lead to malfunction of and cause damage to the AMAX CS-190!

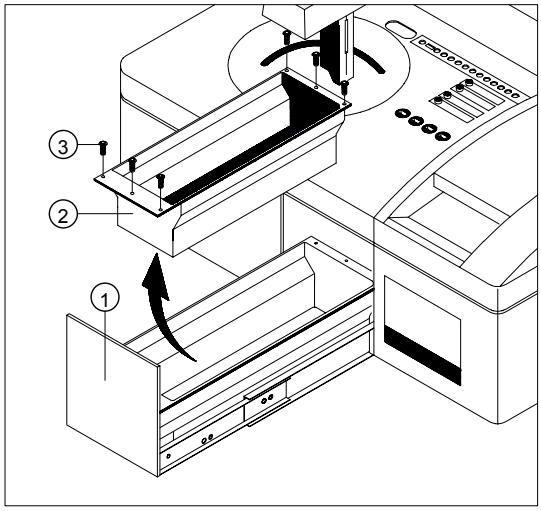
9.8 Cuvette Waste Drawer

Pic. 9.8.1



Cuvette waste drawer	(1)	(Q10006)
Waste container	(2)	
(Bench-top model)		(122584)
(Base cabinet model)		(122588)

Pic. 9.8.2



Cuvette waste drawer	(1)	(Q10006)
Waste container	(2)	(122585)
Screws M3x6 ISO 7380	(3)	(330306)

10. Spare Parts List

Spare Parts List 10 – 1

Artikel ***Article***	**BESCHREIBUNG** ***Description***	**Amelung Nr.**	**Sigma No**
Abdeckung *Top*	für Inkubationsschiene *for incubation rail*	113223	T1937
Abwasserschlauch *Tubing set waste water*	Tank - Gerät *Tank - instrument*	Q90007	T3187
Adapter *Adaptor*	für Reagenzring "groß" *for reagent ring "large“*	113300	A5583
Adapter *Adaptor*	für Reagenzring "mittel" *for reagent ring "medium"*	113297	A5708
Adapter *Adaptor*	für Reagenzring "klein" *for reagent ring "small"*	113323	A1589
Adapter *Adaptor*	mit Feder für Cup im Probenring 5ml *with spring for cup in plasma stand 5 ml*	X10014	A8338
Adapter *Adaptor*	für Hitachi Cup im Probenring 3ml *for Hitachi cup in plasma stand 3 ml*	113317	A1839
Adapter *Adaptor*	für Eppendorf Cup im Probenring 3 ml *for Eppendorf cup in plasma stand 3 ml*	110619	A1964
Adapter *Adaptor*	mit Schlitz für Sarstedt Monovette 1,5 ml *with slot for Sarstedt monovette 1,5 ml*	111869	A0839
Auslegerarm *Cantilever arm*	XYZZ - Arm komplett *XYZZ - arm complete*	Q10009	C7466
Barcodeleser *Barcode reader*	Interner Leser Typ CCD ab AMAX Nr. 3654696 *internal reader type CCD since AMAX No. 3654696*	240019	S0555
Barcodeleser *Barcode reader*	Interner Leser Typ CCD incl. Haltewinkel und Software *internal reader type CCD incl. holder and software*	Q90012	B5798
BD 201 / IRF 540 *BD 201 / IRF 540*	Transistor für Platine PH-I-HZ *Transistor for board PH-I-HZ*	216061	A2340

Brunnen *Rinse*	komplett *complete*	Q90024	W2374
Bus Kabel *Bus cable*	8 Bit Bus / 14-polig (Fotometer) *8 bit bus / 14 cores (photometer)*	273441	
Bus Kabel *Bus cable*	4 Bit Bus / 10-polig / 1800 mm lang *4 bit bus / 10 cores / 1800 mm length*	273442	C1965
Bus Kabel *Bus cable*	4 Bit Bus / 10-polig / 2450 mm lang *4 bit bus / 10 cores / 2450 mm length*	273443	C3343
Deckelsensor *Lid sensor*	Sensor für RPB Rad Deckel *Sensor for RPB wheel lid*	Q90022	A8592
Dichtung 1496 *Seal 1496*	Teflondichtung für Spritze 500 ul *Teflon-seal for syringe 500 ul*	350350	S9178
Dilutorkopf *Dilutorhead*	Ventil für Dilutor *Valve for dilutor*	240090	M2679
Diskette *Disk*	PC Programm deutsch *PC programm German*	S06520	F4673
Diskette *Disk*	PC Programm englisch *PC programm English*	S06521	F4548
Diskette *Disk*	PC Programm französisch *PC programm French*	S06522	F4423
Diskette *Disk*	PC Programm holländisch *PC programm Dutch*	S06523	F4298
Diskette *Disk*	PC Programm italienisch *PC programm Italian*	S06524	F4048
Diskette *Disk*	Service Programm deutsch / englisch *Service programm German / English*	S06531	F3173
Dosierer *Doser*	für Dilutor *for dilutor*	246005	M2179
Durchlauferhitzer *Waterflowheater*	Temperierung Frischwasser *Fresh water warm up*	Q10020	W0889

Einstellehre *Assembly device*	Winkeligkeit Küvettenmagazin *Angularity magazine*	J01820	A1214
Einstellehre *Assembly device*	Hubmagnet *Solenoid*	J01819	
Einstellehre *Assembly device*	Reihenschieber Ende Lichtschranke *Slide pusher end photoelectric barrier*	J01827	
Einstellehre *Assembly device*	Magazin Lichtschranke *Magazine photoelectric barrier*	J01847	
Enzyclean *Enzyclean*	Reinigungsflüssigkeit 12 x 15 ml *Cleaning agent 12 x 15 ml*	110006	A5333
Filtervlies *Synthetic fibre web*	Staubschutzfilter *Dust filter*	120396	S9303
Flachriemen *Flat belt*	Antrieb mechan. Meßstelle *for driving mechanical station*	120441	F7423
Frischwasserschlauch *Tubing set fresh water*	Tank - Gerät *Tank - instrument*	Q90006	T3062
Glasfiberstab *Fibre-glass-stick*	Versteifung Schlauchsatz *Strut for tubing*	483050	F7673
IC LM 35 CH *IC LM 35 CH*	Temp. Sensor für Platine IHZ 2 (Metall) *Temp. sensor for board IHZ 2 (metal)*	218194	I7530
Inkubationsschiene *Incubation rail*	komplett *complete*	Q10005	I7280
Kanister *Can*	ohne Deckel für Frisch- oder Abwasser *without cover for fresh and waste water*	627025	A8812
Kanülenheizung *Canulae heating*	Kanüle incl. Zahnstange *Canulae heating incl. toothed rack*	D10044	C7716
Kanüle *Canulae*	Pipettierer (Glaskeramik) *Pipetter*	D10182	C9071
Kniehebel *Toggle lever*	für mechan. Meßstelle *for mechan. measuring channel*	D10074	T0312

Kühlflüssigkeit GF 15 *Anti-freezing liquid*	für Kühl- u. Warmwasserkreislauf 500 ml *for cool and warm water 500 ml*	830040	A0589
Küvettenhaltefeder *Cuvette holding spring*	für mechanisches Meßzentrum *for mechanical measuring station*	359412	C6591
Küvettenhaltefeder *Cuvette holding spring*	für optisches Meßzentrum *for optical measuring station*	120924	C6716
Küvettenmagazin *Cuvette storage unit*	komplett *complete*	D10007	C6466
Lampe *Lamp*	für Photometer *for photometer*	247410	A3335
Lichtschranke *Light barrier*	OPB 911 *OPB 911*	249530	L6036
Lichtschranke *Light barrier*	OPB 755 *OPB 755*	249534	L6161
Lichtwellenleiter Fiber optic	5 - armig 5 - arm	247427	A5341
Lüfter *Fan*	Kühlung für Gerät *for cooling system*	241018	F7422
Meßstelle *Measuring channel*	Einzelmeßstelle Photometer *Single channel for photometer*	D10087	M5304
Meßzentrum mech. *Mechanical station*	mech. Meßzentrum komplett *mech. measuring station complete*	Q10011	M6054
Meßzentrum optisch *Optical station*	opt. Meßzentrum komplett *opt. measuring station complete*	Q10010	O3265
Motor *Motor*	für Antrieb Reagenzrad komplett *for reagent carousel complete*	Q90031	M0426
Motor *Motor*	für Y-Antrieb komplett *for Y-drive complete*	Q90025	M0676
Motor *Motor*	für X-Antrieb komplett *for X-drive complete*	Q90026	M0551

Motor *Motor*	Z-Antrieb incl. Motorhalter u. Kupplung *Z drive complete incl. holder*	Q90016	M5929
Motor *Motor*	Antrieb mech. Meßstelle *Driving mech. measuring station*	Q90019	M6679
MTP 8P10 *MTP 8P10*	Transistor für Platine PH - R2R *Transistor for board PH - R2R*	216060	M6929
Netzteil I (untere NT) *Power supply I*	Netzteilmodul für + 5, + 24, - 24 Volt *Power supply for + 5, + 24, - 24 volts*	245520	P1596
Netzteil II *Power supply II*	Netzteilmodul für + 12, + 15, + 24 Volt *Power supply for + 12, + 15, + 24 volts*	245525	P1721
One Chip CPU *One chip CPU*	„Magazin“ *„Magazin“*	S60900	E1648
One Chip CPU *One chip CPU*	„Kugelmeßz.“ *„Kugelmeßz.“*	S61100	
One Chip CPU *One chip CPU*	„Klappmech.“ (für alte Feder bis AMAX CS-190 Nr.97Q50560) *„Klappmech.“ (for old spring to AMAX CS-190 No. 97Q50560)*	S60700	
One Chip CPU *One chip CPU*	„Klappmech.“ (für neue Feder ab AMAX CS-190 Nr. 97Q50561) *„Klappmech.“ (for new spring after AMAX CS-190 No. 97Q50561)*	S60701	
One Chip CPU *One chip CPU*	"RPB - Rad" *"RPB - Rad"*	S06210	O4140
One Chip CPU *One chip CPU*	"Wasser" *"Wasser"*	S06211	O4265
One Chip CPU *One chip CPU*	"XYZZ - Robot" *"XYZZ - Robot"*	S06212	O4390
One Chip CPU *One chip CPU*	"Dilutor" *"Dilutor"*	S06213	O4515
One Chip CPU *One chip CPU*	Firmware Cavro Dosierer *Firmware Cavro Doser*	S06233	A8092

One Chip CPU *One chip CPU*	"Foto Ladeprg." *"Foto Ladeprg."*	S61500	O2515
One Chip CPU *One chip CPU*	"AD - Wandler" *"AD - Wandler"*	S06215	O1015
O-Ring 720396 *O-ring 720396*	Dichtung für Spritze 500 ul *Seal for syringe 500 ul*	350121	SO3015
O-Ring 3 x 1 *O-ring 3 x 1*	Dichtung für Dilutor-Ventil *Seal for dilutor-valve*	350001	O3140
O-Ring 14 x 2,5 *O-Ring 14 x 2,5*	Dichtung für separaten Wassereinfülltank (100 Stck) *Seal for separate watertank (100 pcs.)*	350109	P1887
Peltierelement *Peltier element*	Kühlung Plasma-Reagenzrad *Cooling plasma-reagent-tray*	266010	P1096
Plasmateller *Plasma stand*	Aufnahme Plasmen *for accommodating plasmas*	Q90001	A9083
Plasmateller 3 ml *Plasma stand 3 ml*	für 3 ml Röhrchen *for 3 ml tubes*	Q90003	A1458
Plasmateller *Plasma stand*	universal *universal*	Q90023	
Platine S-HY *PC board S-HY*	SE Auswertung *SE evaluation*	Q90015	P1971
Platine PH-MCK *PC board PH-MCK*	Bus Adapter *Bus adaptor*	D00801	P2096
Platine PH-MCK2 *PC board PH-MCK2*	Bus Adapter *Bus adaptor*	D03601	P2221
Platine PH-K1 *PC board PH-K1*	Magazinsteuerung *Repository control*	D03001	P2346
Platine PH-K2 *PC board PH-K2*	Magazinsteuerung *Repository control*	D03101	P2471
Platine PH-K3 *PC board PH-K3*	Magazinsteuerung *Repository control*	D03201	P2596

Platine PH-K4 *PC board PH-K4*	Magazinsteuerung *Repository control*	D03301	P2721
Platine PH-K5 *PC board PH-K5*	Magazinsteuerung *Repository control*	D03401	P2846
Platine ADAP15 *PC board ADAP15*	Magazinsteuerung *Repository control*	D04101	P2971
Platine PH-K-A1 *PC board PH-K-A1*	Magazinsteuerung *Repository control*	D04001	P3096
Platine PH-XYZZ *PC board PH-XYZZ*	Robotsteuerung *Robot control*	D00101	P3221
Platine PH-RC *PC board PH-RC*	Filterplatine *Filter board*	D01401	P3346
Platine PH-AD-346 *PC board PH-AD-346*	Adapterkarte X *Adaptor board X*	D01801	P3471
Platine PH-X-ADA2 *PC board PH-X-ADA2*	Adapterkarte Y incl. Motor-Entstörung *Adaptor board Y incl. motor-interference suppr*	D01302	
Platine PH-F *PC board PH-F*	Sicherungskarte Photometer *Photometer fuse board*	D05901	P3721
Platine AM-F2 *PC board AM-F2*	Sicherungskarte Stromversorgung *Main fuse board*	D07101	P3846
Platine AM-DIL *PC board AM-DIL*	Dilutorsteuerung *Dilutor control*	D05701	P3971
Platine AM-RPB *PC board AM-RPB*	Steuerung Reagenz-Plasmarad *Control reagent-plasma-carousel*	D00301	P4096
Platine PH-TU *PC board PH-TU*	Temperatur Messung (ohne LM 35) *temperature measurement (without LM 35)*	D02601	P4346
Platine PH-LSX *PC board PH-LSX*	Level Sensorik *Level sensory electronics*	D01702	P4471

Platine AM-I-HZ *PC board AM-I-HZ*	Heizung Inkubationsschiene (ohne IRF 540) *Heating incubation-rail (without IRF 540)*	D07401	P4596
Platine PH-IHZ2 *PC board PH-IHZ2*	Heizungsplatine Kanülenheizung und Durchlauferhitzer *Heating board for canulae-heating and waterflow heater*	D01101	P4721
Platine PH-O-RA *PC board PH-O-RA*	RK Adapter *RK adaptor*	D06401	P4846
Platine PH-O-RK *PC board PH-O-RK*	Rechnerkarte Photometer *Computer card photometer*	D02501	P4971
Platine PH-R 2 R *PC board PH-R 2 R*	Steuerung Peltier Elemente (ohne MTP8P10) *Control for peltier elements (without MTP8P10)*	D06101	P5221
Platine PH-M-MB *PC board PH-M-MB*	Steuerung mech. Meßstelle *Control for mech. measuring station*	D05601	P5346
Platine PH-AD-16B *PC board PH-AD-16B*	AD Wandler *AD transducer*	D07001	P5471
Platine PH-BUE *PC board PH-BUE*	Anschluß Board zum PC *connecting to PC*	D02701	P5596
Platine AM-M-HT *PC board AM-M-HT*	Heizung mech. Meßstelle *Heating mech. measuring channel*	D06301	P5721
Platine AM-M-SH *PC board AM-M-SH*	Steuerung mech. Meßstelle *Control mech. measuring channel*	D06901	P5846
Platine PH-HALL *PC board PH-HALL*	Steuerung Magnetgeber *Control hall switch*	D05201	P5470
Platine PH-H 2 O *PC board PH-H 2 O*	Steuerung Wasserkreislauf *Control water circulation*	D00901	P6096
Platine PH-O-HZ *PC board PH-O-HZ*	Heizung opt. Meßzentrum *Heating opt. measuring center*	D06501	P4720

Lichtstromregelung kompl. *light current regulator complete*	Photometer Version 1 *Photometer version 1*	Q10015	P5220
Lichtstromregelung kompl. *photocurrent regulator complete*	Photometer Version 2 *Photometer version 2*	Q10115	P5345
Platine *PC board*	Mutterbord - Photometer Version 1 *Motherboard photometer Version 2*	D04701 D08201	P6596
Platine *PC board*	Analogfilter Photometer (Meßverstärker) bis 8/95 Version 1 *Analoge filter photometer (measuring amp.) until 8/95 version 1*	D04401	P4845
Platine AM-O-MV *PC board AM-O-MV*	Analogfilter Photometer (Meßverstärker) ab 8/95 Version 2 *Analoge filter photometer (measuring amp.) since 8/95 version 2*	D08101	P4970
Platine *PC board*	Referenzkanal Photometer Version 1 *Analoge filter ref. photometer version 1*	D04801	P7096
Platine *PC board*	Netzteil Photometer-Verstärker Version 1 *regulator photometer version 2*	D04501 D08301	P7221
Platine PH-PC *PC board PH-PC*	Interface für PC *Interface for PC*	D02801	P7346
Pneumatic-Schlauch *Pneumatic-tubing*	Maß 6 x 4 per 1000 mm *Dim. 6 x 4 per 1000 mm*	239020	P0721
PU-Schlauch *PU-tubing*	Maß 2 x 0,5 x 3 schwarz per 1000mm *Dim. 2 x 0,5 x 3 black per 1000 mm*	239260	P0971
PVC-Schlauch *PVC-tubing*	Maß 9 x 1.5 per 1000 mm *Dim. 9 x 1.5 per 1000 mm*	239290	P0846
Reagenzrad *Reagent carousel*	komlett *complete*	Q10004	R7524

Reagenzteller *Reagent stand*	Aufnahme Reagenzien *for accommodating reagents*	Q90002	A1583
Referenzkanal *Reference channel*	für Photometer Version 2 *for photometer version 2*	D10088	C3717
RPB Rad Sensor *RPB wheel sensor*	Ersatzteil Kit komplett *Spare part kit complete*	Q90032	
Rührer *Stirrer*	für Reagenz *for reagent*	242220	S9553
Rührer *Stirrer*	Magnetrührer für Inkubations-Schiene *for incubation rail*	D10071	S9678
Schieber 2 *Slide 2*	Schieber zum Öffnen der opt. Meßstelle *Slide for opening opt. channel*	113282	S9428
Schlauch *Waste pump tube*	Ersatzschlauch für Abwasserpumpe *Sparepart for waste pump*	241051	W1014
Schlauchpumpe *Peristalic pump*	für Abwasser *for effluent*	241050	P1221
Schlauchsatz *Tubing set*	Dilutor-Kanüle (zur Z-Achse) *Dilutor-canulae (to z-axis)*	Q10062	A1958
Schlauchsatz *Tubing set*	Kanülenheizung (zur Z-Achse) mit Glasfiberstab *canulae heating to z-axis without fibre-glass-stick*	Q10063	T1812
Schwingkolbenpumpe *Oscillating piston pump*	für Dilutor-Vorlauf *for dilutor*	241088	O3390
Schwingkolbenpumpe *Oscillating piston pump*	für Kühlwasserkreislauf *for coolant water circulation*	241087	O2640
Platine AM-S-HY + Sensor *Platine and AM-S-HY + sensor*	komplett geprüft *compl. proofed*	Q90015	S8428
Silicon-Schlauch *Silicon-tubing*	Maß D 5.5 / d 2 per 1000 mm *Dim. D 5.5 / d 2 per 1000 mm*	239040	S0179

Silicon-Schlauch *Silicon-tubing*	Maß D 6 / d 3 per 1000 mm *Dim. D 6 / d 3 per 1000 mm*	239080	S0304
Silicon-Schlauch *Silicon-tubing*	Maß D 8 / d 4 per 1000 mm *dim. D 8 / d 4 per 1000 mm*	239670	S0429
Spritze 500 ul *Syringe 500 ul*	für Dilutor *for dilutor*	290007	A1833
Tragegriff *Carrying handle*	Transportgriffe zum Tragen (1 Stk.) *Handle for transporting*	110626	C7091
Tygon-Schlauch *Tygon-tubing*	Maß D 1.14 / d 0.84 per 1000 mm *Dim. D 1.14 / d 0.84 per 1000 mm*	239001	T1312
Wasserbehälter II *Watertank II*	Temperierung Warmwasserkreislauf *Water warm up*	D10068	W0389
Wasserfilter *Water filter*	Filter für Kühlwasserkreislauf *Coolant water circulation*	241071	W0514
Zahnriemen *Toothed driving belt*	Antrieb für Dilutor *Drive for dilutor*	120505	
Zahnriemen *Toothed driving belt*	X-Antrieb (lang) *X-drive (long)*	120449	T2062
Zahnriemen *Toothed driving belt*	Y-Antreib (lang) *Y-drive (long)*	120451	T1187
Zahnriemen *Toothed driving belt*	X-Antrieb (kurz) *X-drive (short)*	120448	T2312
Zahnriemen *Toothed driving belt*	Y-Antrieb (kurz) *Y-drive (short)*	120453	T1062
Zahnriemen *Toothed driving belt*	Antrieb für RPB-Rad *Drive for RPB-wheel*	120461	
Zahnriemen *Toothed driving belt*	Antrieb für RPB-Rad *Drive for RPB-wheel*	120462	

11. Service Software

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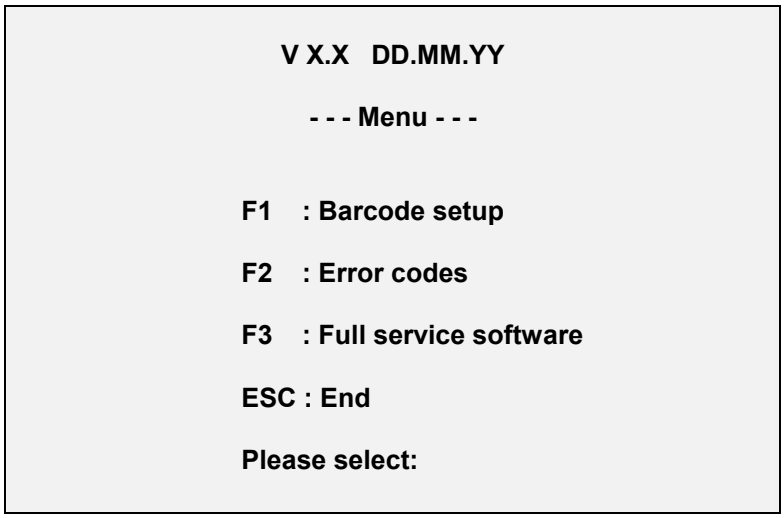
In addition to the user software, the service software has been installed on the commander PC ⇒ ***Service program***.

The AMAX CS-190 has to be operational: The instrument has to be turned on and connected to the commander PC.

7.5

In order to access the service software, exit the user software.
The screen should say **C:\AMAX.** Access the menu screen by pressing **<S>.**

Pic. 11.0.1



Choose the desired program from the menu by using the function keys:

<F1> : **Barcode setup**
Adjusts the barcode reader of the reagent-plasma-tray. (Older version, has become obsolete in combination with the new barcode reader).

<F2> : **Error codes**
Error codes, which appeared on the screen as part of an error message of a module, can be entered here. The deciphering of the entered code appears on the screen.

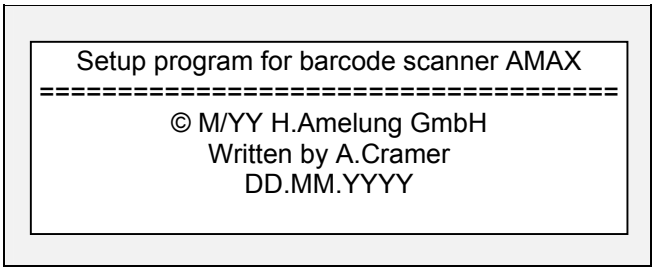
<F3> : **Full service software**
Starts the full ***service program***.

<ESC> : **End**
Exits the program and the screen displays: **C:\AMAX**.

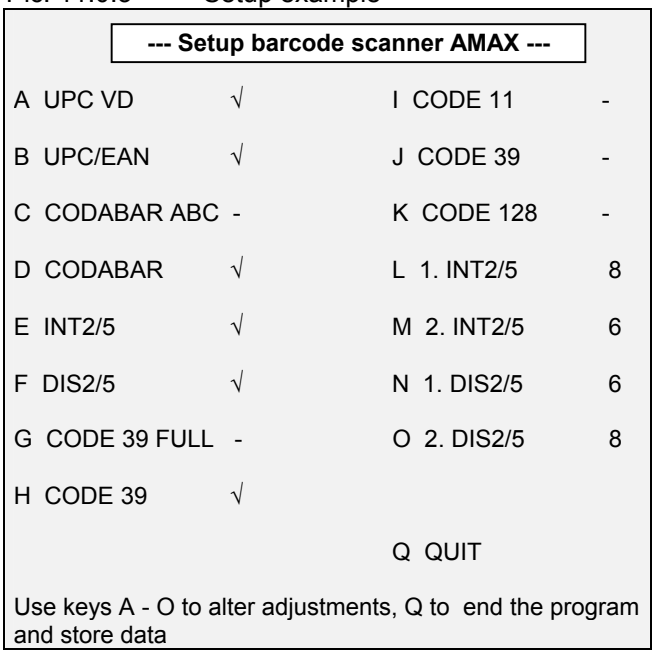
<F1>: Barcode setup

<F1> opens the window barcode setup AMAX CS-190 (Pic. 11.0.2)

Pic. 11.0.2



Pic. 11.0.3 Setup example



<A> - <O> : Each barcode can be selected (on or off).

<Q> : Exits the program and stores the setup.

The screen displays:

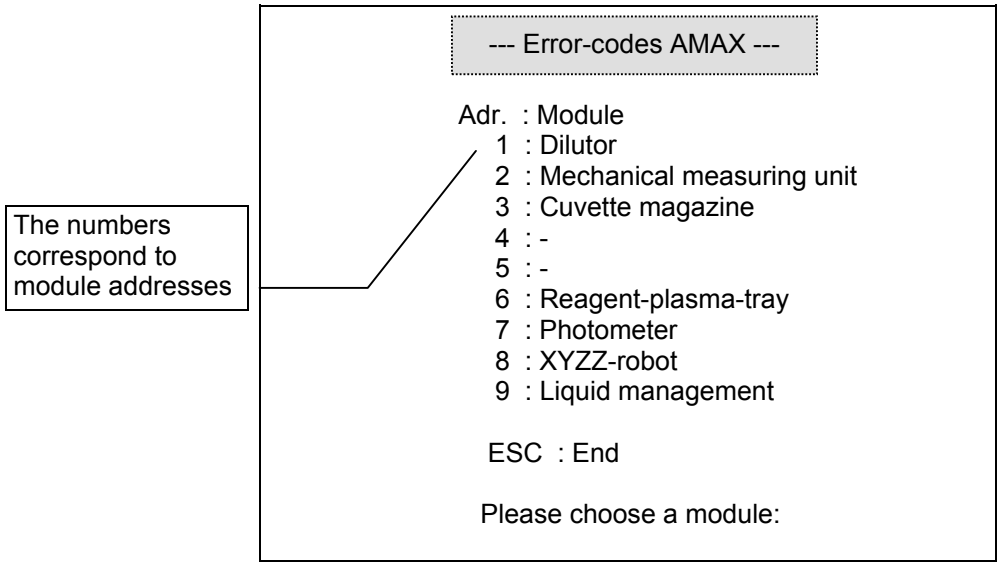
- - - AMAX service program main menu - - -

IMPORTANT!
The barcode setup program was created only for a particular barcode scanner generation. Should the program not be accessible, the installed scanner does not need to be adjusted.

<F2>: Error codes

<F2> opens the window “Error codes AMAX“ (Pic. 11.0.4)

Pic. 11.0.4



When selecting a module, you will be asked whether you want to decipher an error code or if you want to inquire an error via the AML-Bus.

- After entering an error code, the error code description is displayed on the screen.
- When making a query using the AML-bus, the description appears on the screen after the corresponding module has been scanned.

<ESC> exits the program. The screen displays:

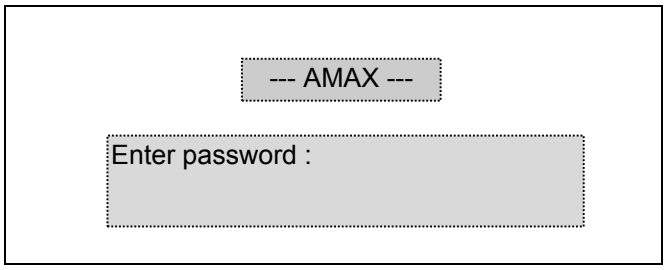
- - - AMAX service program main menu - - -

<F3>: Full service software

When the **full service software** is accessed by **<F3>**, a password protection window appears (Pic. 11.0.5). Here you have to enter the password. It protects the service program from **unauthorised** access.

ATTENTION!
Disregard may lead to malfunction of the AMAX CS-190!

Pic. 11.0.5



Enter the password here to start the ***service program***.

The password is: LIPPE (lippe)

When the password has been entered correctly, the **main menu** (Pic. 11.0.6) of the **service software** appears.

By using the function keys **<F1> - <F10> / <ALT+F1> - <ALT+F10>**, each service program is started.

Pic. 11.0.6

- - - AMAX service program main menu - - -

F1	: XYZZ-robot	ALT F1	: Error codes
F2	: Dilutor	ALT F2	: 16-Bit AD-converter
F3	: Cuvette magazine	ALT F3	: AMAX continuous test program
F4	: Reagent-plasma-tray	ALT F4	: AML-BUS 4-Bit
F5	: Liquid management	ALT F5	: AML-BUS 8-Bit
F6	: Photometer	ALT F6	: Service logbook
F7	: Mechanical measuring unit	ALT F7	: Text viewer
F8	: AMAX teach program	ALT F8	: AMAX continuous test II program
F9	: AMAX self test program	ALT F9	: Drip test
F10	: Barcode setup	ALT F10	: Photometer auto align
ESC	: End		

Please select :

Appearance of a message in the service program

In the running service program, a message from a module can appear on the screen. This message appears in a pink box (see Pic. 11.0.7) with the designation: Error master question.

Pic. 11.0.7

Error master question

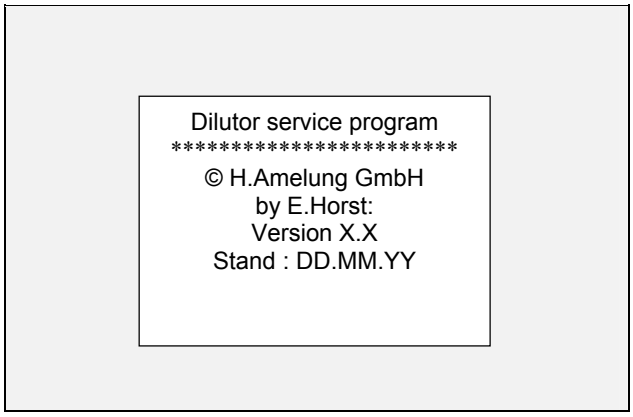
Check, if this message indicates an impairment of the module's performance. If it doesn't, the message can be ignored.

ATTENTION!
Disregard may lead to malfunction of the AMAX CS-190!

11.1 Dilutor

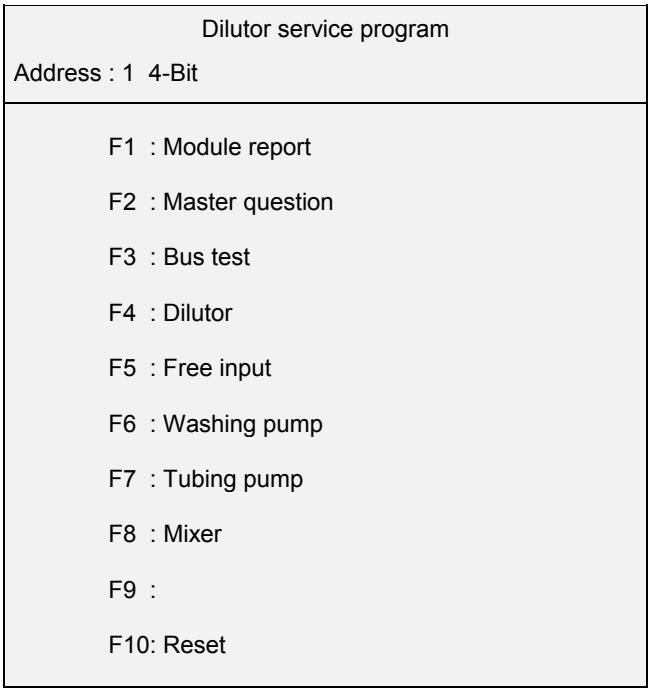
<F2> selects the window “Dilutor service program“ (Pic. 11.1.1)

Pic. 11.1.1



<F1> - **<F10>** : Selects the associated program parts.

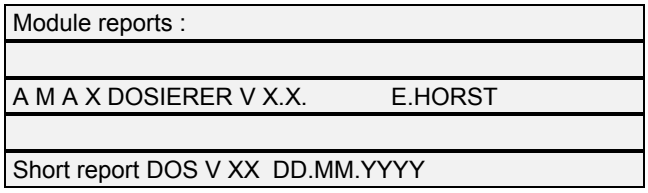
Pic. 11.1.2



In the following sections, the display of each program part is described individually:

<F1> : This module report is displayed.

Pic. 11.1.3



<F2> : The master question is queried here. The answer is displayed on the screen.
Pic.11.1.4 shows an example.

Pic. 11.1.4

Answer master question : 8	
0	B7 Last command is executed
0	B6 Parameter out of limits
0	B5 Wrong command code
0	B4 Parameter number wrong
1	B3 Dilutor command is executed
0	B2 Dilutor error
0	B1 Water shortage
0	B0

<F3> : Starts the AML-BUS test.

The communication between the photometer and the commander PC is checked. Should a problem occur (interruption), it can be determined here.
⇒ **Error message**

Pic. 11.1.5

How often shall the test be repeated ? X

Number of tests executed :

Number of error runs : X means X.X%

<F4> : Selects a sub-program for the dilutor. Each sub-program can be selected here.

Pic. 11.1.6

Dilutor service program

Address : 1 4-Bit

1 : Dilutor test commands

2 : Dilutor query

3 : Dilutor commands

4 : Dilutor baud rate

5 : Dilutor address

6 : Dilutor status

End = ESC

<1> : Sub-program
"Dilutor test commands"

<1> ,
<2> : The output of the dilutor is initialised. The user can decide if the output of the valve should be on the right or left side.

<3> ,
<4> ,
<5> : The individual valve positions can be selected.

<6> : The plunger moves to position 1.

<7> : The plunger moves to position 2.

<8> : The speed of the plunger is increased.

<9> : The speed of the plunger is decreased.

Pic. 11.1.7

Dilutor service program
Address : 1 4-Bit
1 : Initialises right output
2 : Initialises left output
3 : Valve input
4 : Valve output
5 : Valve bypass
6 : Move to position 1
7 : Move to position 2
8 : Set speed fast
9 : Set speed slow
T : Test program
ESC : End

<T> : The dilutor carries out a test routine with different speeds.

<ESC> : Exits the sub-program "Dilutor test commands".

<2> : Sub-program:
Dilutor query

Data from the dilutor is queried and displayed here.

Pic. 11.1.8

Dilutor service program	
Address : 1 4-Bit	
Plunger position	= X
Start velocity	= XXX
Top velocity	= XXXX
Stop velocity	= XXX
Lost valve steps	= X
Number of valve movements	= XX
Supply voltage	= XX
Firmware	= XL-3000 M YYYY P/N XXX
End = ESC	

<3> : Sub-program "Dilutor commands"

<1>
-
<B> : Dilutor parameters can be altered.

This is irrelevant for service use.

<ESC> : Exits the sub-program "Dilutor commands".

Pic. 11.1.9

Dilutor service program
Address : 1 4-Bit
1 : Set speed
2 : Set absolute position
3 : Set relative aspiration
4 : Set relative dispense
5 : Set top velocity
6 : Set start velocity
7 : Set cutoff steps
8 : Set cutoff velocity
9 : Set slope
B : Set backlash
End = ESC

<4> : Sub-program "Dilutor baud rate" The baud rate can be adjusted.

Pic. 11.1.10

Baud rate 1200 - 19000 ?

This is irrelevant for service use.

<5> : Sub-program "Dilutor address" The dilutor address can be altered.

Pic. 11.1.11

Dilutor address 1-F

This is irrelevant for service use.

<6> : Sub-program "Dilutor status" The dilutor status can be queried here.

Pic. 11.1.12

Dilutor status : No error
End = ESC

<ESC> : Exits the sub-program "Dilutor".

<F5> : A command can be entered in hexadecimal format.

Pic. 11.1.13

Order to transmit (in Hex) :

This is irrelevant for service use.

Pic. 11.1.14

Dilutor service program Address : 1 4-Bit
1 : Pump on with frequency 2 : Set frequency 3 : Pump on 4 : Pump off 5 : Pump on for defined time 6 : Set water deficiency 7 : Query water levels 8 : Automatic venting to disable 9 : Automatic venting to enable End = ESC

<F6> : Sub-program “Rinse pump“

<1>
-
<5> : The rinse pump can be accessed.

<6> : A water deficiency can be simulated.

<7> : The water levels can be queried.

<8> ,
<9> : The automatic venting can be enabled or disabled.

<ESC> : Exits the sub-program “Rinse pump“.

<F7>,
<F8> : These sub-programs are not needed (no function).

They are irrelevant for service use.

<F10> : The dilutor is reset. All parameters are restored to their original values.

<ESC> : Exits the dilutor service program. The screen displays:

- - - AMAX service program main menu - - -

11.2 Mechanical Measuring Unit

<F7> opens the window “Mechanical Measuring Unit Service Program“ (Pic. 11.2.1)

Pic. 11.2.1

```
**********************************************************************
*                                                                    *
*                                                                    *
*        MECHANICAL  MEASURING  UNIT  SERVICE  PROGRAM               *
*        ==============================================              *
*                                                                    *
*                                                                    *
*                                                                    *
*        © MM/YY Heinrich Amelung GmbH                               *
*                                                                    *
*        Written by A.Cramer                                         *
*                                                                    *
*        Machine : AMAX                                              *
*                                                                    *
*                                                                    *
*        Carry on with any key                                       *
**********************************************************************
```

Pic 11.2.2 shows a window with each executable command.

Pic. 11.2.2

```
                Service program mechanical measuring unit  AMAX

O.......Open and close measuring channel

1 - 4...measuring channel 1 - 4 start and stop

I.........Start incubation time

M.......Display module report

B........Test AML-BUS connection

R........Execute software reset

T........Measure and show temperature

V........Change parameter

Z........Display current measuring channel status

E........Exit program

Please choose :

                                  Incub.MZ1:   stop
                                  Incub.MZ2:   stop
                                  Incub.MZ3:   stop
                                  Incub.MZ4:   stop

                                  Measure MZ1: stop
                                  Measure MZ2: stop
                                  Measure MZ3: stop
                                  Measure MZ4: stop
```

Execute commands by using the keys ***<O> - <Z>.***

<O> : Any measuring cell (knee joint) can be opened or closed.

Pic. 11.2.3

```
Open and close measuring channels for cuvette waste
disposal:
==========================================

1...4 Measuring channel 1-4 open and close
Only one measuring channel can be opened at the same
time!

Abort with ESC
```

<1> - **<4>** : Any measuring cell (no. 1-4) can be activated or deactivated. **A real measurement is not possible with this part of the program.**

Pic. 11.2.4

```
Start the measuring channel with the number X :
====================================

Measurement timeout is:          205 s
Interval start time is:           77 s
Starting value pause time is:     1 x 0,1 s

Start with the connected pipette or with <P>  !
Abort with ESC !
```

<I> : Starts the incubation time any measuring cell.

Pic. 11.2.5

```
Start incubation time :
=================

120 seconds will be incubated !

Measuring channel number in which to incubate ? (1-6) :
```

<M> : Displays a module report.

Pic. 11.2.6

```
Module reports are :
================

AMAX    MECHMESS PROTOTYP A:CRAMER

Module short report is:

Module: KMM Version: X Datum: DD.MM.YYYY

Carry on with any key
```

<B> : Starts the AML-BUS test. The communication between the mechanical measuring unit and the commander PC is checked.

Pic. 11.2.7

```
Test AML-Bus connection :
====================

Abort with ESC

Number of test runs : 5
```

Should a problem (interruption) occur, it can be determined here.
⇒ **Error message**

<R> : The measuring cell carries out a reset.
All parameters are reset to their old values.

Pic. 11.2.8

Send software reset to the mechanical measuring channel:
==========
Please wait ...
Number of measuring channels is 4
ATTENTION : All parameters are back to their starting values !
Carry on with any key

<T> : The temperature of the measuring unit is measured and displayed.

Pic. 11.2.9

Measure and show temperature ALU-block :
==========
Abort with ESC
Temperature ALU-Block is : 38°C

<V> : Alters the setup of the measuring cell.

This is irrelevant for service use.

Pic. 11.2.10

Adjust parameters of the measuring channels :
==========

Enter measuring channels start-up time (x 100ms)	:**X.Xs**
Interval mode starting time measuring channel 1 (in s)	:**X.Xs**
Start time is	:**X.Xs**
Enter measuring channels start-up time (x 100ms)	:**X.Xs**
Interval mode starting time measuring channel 2 (in s)	:**X.Xs**
Start time is	:**X.Xs**
Enter measuring channels start-up time (x 100ms)	:**X.Xs**
Interval mode starting time measuring channel 3 (in s)	:**X.Xs**
Start time is	:**X.Xs**
Enter measuring channels start-up time (x 100ms)	:**X.Xs**
Interval mode starting time measuring channel 4 (in s)	:**X.Xs**
Start time is	:**X.Xs**
Int. mode starting value pause time measuring channel 1 (in s)	:X.Xs
Int. mode starting value pause time measuring channel 2 (in s)	:X.Xs
Int. mode starting value pause time measuring channel 3 (in s)	:X.Xs
Int. mode starting value pause time measuring channel 4 (in s)	:X.Xs
Enter measurement timeout (in s)	:X.Xs
Timeout	:**X.Xs**
Enter incubation time (in s)	:X.Xs
Enter delay time Start ⇒ Rotate (x 0.1s)	:X.Xs

Carry on with any key

<Z> : Shows the current status of the measuring cells.

This is irrelevant for service use.

Pic. 11.2.11

Display current measuring channel status:
==========
Abort with ESC !

	Timer	Sens.	Res.	Int1	Int2	Int3
Channel 1	low	low	low	low	low	low
Channel 2	low	low	low	low	low	low
Channel 3	low	low	low	low	low	low
Channel 4	low	low	low	low	low	low

<E> : Exits the mechanical measuring unit service program. The screen displays:

- - - AMAX service program main menu - - -

11.3 Cuvette Magazine

<F3> opens the window “Cuvette Magazine Service Program“ (Pic. 11.3.1):

Pic. 11.3.1

```
**********************************************************************
*                                                                    *
*                                                                    *
*              CUVETTE  MAGAZINE  SERVICE  PROGRAM                   *
*              ===================================                   *
*                                                                    *
*                                                                    *
*                                                                    *
*              © MM/YY Heinrich Amelung GmbH                         *
*                                                                    *
*              Written by A.Cramer                                   *
*                                                                    *
*              Machine : AMAX                                        *
*                                                                    *
*                                                                    *
*              Carry on with any key                                 *
**********************************************************************
```

<j> : Resets the cuvette magazine (has to be carried out after any reboot of the AMAX CS-190)

Pic. 11.3.2

```
Execute software reset routine (y/n) ?
```

Picture 11.3.3 shows each of the window’s executable commands.

*Press keys **<I> - <E>.***

Pic. 11.3.3

```
            Service program cuvette magazine AMAX

Program menu :
=============

 I ...Single commands incubation rail
M...Display module command
B...Test AML-Bus connection
R...Execute software reset
L...Display light barriers
F...Execute test routine
S...Single commands row pusher
K...Single commands cuvette comb
T...Single commands conveyor and lifting solenoids
P...Adjust speeds and run times
E...End program

Please choose:
```

<I> : The commands of the incubation rail (Q10005) can be accessed here.
Press keys ***<1> - <9>.***

Function check of the lifting solenoid and the light barrier setup.

<ESC> exits this sub-program.

Pic. 11.3.4

```
Edit single commands incubation rail :
==============================

Abort with ESC !

1...Cuvette pusher to the top
2...Cuvette pusher to the bottom
3...Mixer start
4...Mixer stop
5...Lifting magnet incubation rail on
6...Lifting magnet incubation rail off
9...Continuous test lifting solenoid

Please choose :
```

<M> : Displays the module report.

Pic. 11.3.5

```
The module reports are :
====================

AMAX    MAGAZIN    PROTOTYP A:CRAMER


Module short report is :

Module: KMA Version: X Datum: DD.MM.YYYY

Carry on with any key
```

<B> : Starts the AML-BUS test. The communication between the cuvette magazine and the commander PC is checked. Should a problem occur (interruption), it can be determined here.
⇒ **Error message**

Pic. 11.3.6

```
Test AML-Bus connection :
=====================

Abort with ESC !

Test runs  :  5
```

<R> : The cuvette magazine carries out a reset. All parameters are restored to their original values.

Pic. 11.3.7

```
Transmit soft reset to the cuvette magazine :
===================================

Please wait .....

Carry on with any key
```

<L> : The status of the cuvette magazine light barriers are displayed. A functionality check is possible by manually moving the pusher/switch.
The reflection light barriers are checked by blocking them with a cuvette box.

Pic. 11.3.8

```
Show light barrier status :
====================
Abort with ESC !

Cuvette pusher at the bottom                                  : low
Cuvette pusher at the top                                     : high
Row pusher at the end                                         : high
Row pusher at beginning                                       : high
Row pusher at tension point                                   : high
Cuvette comb at tension point                                 : high
Cuvette comb is moved up                                      : high
Cuvette comb is moved down                                    : low
Cuvette comb is moved to the front                            : high
Cuvette comb is moved to the back                : high
Reflex light barrier is in front                              : low
Reflex light barrier magazine blockage waste disposal : high
Reflex light barrier magazine supply                          : low
```

<F> : The cuvette magazine carries out a test routine.
All components are included.

Pic. 11.3.9

```
Execute test routine :
=================

Abort with ESC !

          Move cuvette into the XYZZ-robot

Test - Cycle No.: X
```

IMPORTANT!
This command may be executed only when the cuvette magazine has been disassembled. When still installed, the cuvettes can't be processed by the XYZZ-robot, because the robot cannot be addressed with this program.

<S> : The row pusher can be put under tension or moved to its original position.

Press keys ***<1>, <2>.***

Pic. 11.3.10

```
Edit single commands row pusher :
============================

Abort with ESC !

1...Tighten row pusher
2...Drive back row pusher
```

<K> : The cuvette comb can be moved to different positions.

Press keys ***<1> - <4>***

Pic. 11.3.11

```
Edit single commands cuvette comb :
============================

Abort with ESC !

1...Tighten cuvette comb
2...Move cuvette comb back
3...Move cuvette comb to the top
4...Move cuvette comb to the bottom
```

<T> : The conveyors for the cuvette boxes can be activated or deactivated. The lifting solenoids in the cuvette box storage area can be retracted.
Press keys ***<1> - <5>***

Pic. 11.3.12

```
Edit single commands conveyor and lifting solenoids:
============================================

Abort with ESC !

1...Start supply conveyor
2...Stop supply conveyor
3...Waste disposal band on for defined run time
4...Lifting solenoids on
5...Lifting solenoids off
```

IMPORTANT!
Never leave the conveyors and the lifting solenoids turned on for longer than 30sec.

<P> : The speed and the running times of the individual stepper motors can be adjusted. Default values are displayed in brackets.

This is irrelevant for service use.

Pic. 11.3.13

```
Adjust speeds of the stepper motors and run times:
==========================================
Enter cuvette pusher speed (1-255) (40)              :
Enter row pusher speed (1-255) (40)                  :
Enter cuvette comb speed (1-255) (60)                :
Adjust waste disposal band run time (x 40ms) (70)    :
Adjust mixing duration (x 40ms) (25)                 :
```

ATTENTION!
Disregard can cause damage to the AMAX CS-190!

<E> : Exits the cuvette magazine service program. The screen displays:

- - - AMAX service program main menu - - -

11.4 Reagent-Plasma-Tray

<F4> opens the window “Reagent-Plasma-Tray Service Program“ (Pic. 11.4.1):

Pic. 11.4.1

```
*****************************************************************
*                                                               *
*                                                               *
*        REAGENT - PLASMA - TRAY  SERVICE  PROGRAM              *
*        =========================================              *
*                                                               *
*                                                               *
*                                                               *
*       © MM/YY Heinrich Amelung GmbH                           *
*                                                               *
*       Written by A.Cramer                                     *
*                                                               *
*       Machine : AMAX                                          *
*                                                               *
*                                                               *
*       Carry on with any key                                   *
*****************************************************************
```

Pic. 11.4.2 shows each of the window’s executable commands.

Press keys ***<0> - <E>.***

Pic. 11.4.2

```
        Service program reagent-plasma-tray  AMAX

Program menu :
=============

0...Show current rotor position
1...Display module report
2...Test AML-Bus connection
3...Execute software reset
4...Display light barriers reset and lid
5...Execute test routine
8...Move rotor
9...Switch barcode scanner beam on
S...Scan barcodes
 I...Identify barcode scanner version
M...Measure and display cooling temperature
R...Switch mixer on/off and adjust rotational speed
E...End program

Please choose :
```

<0> : Confirms that the reagent-plasma-tray voltage has been turned off. The position display can be checked by manually repositioning the tray.

Pic. 11.4.3

Show current servo axis position :
==========
Servo motor is turned off !
Abort with ESC !
Current position is : X XXXX

<1> : Display of the module report.

Pic. 11.4.4

The module reports are :
==========
Module short report is :
AMAX REAGENZRAD PROTOTYP A. CRAMER WAXXXX
Module: RPB Version: X Date: DD.MM.YYYY
Carry on with any key

<2> : Starts the AML-BUS test. The AML-Bus test is used to check the communication between the reagent-plasma-tray and the commander PC. Should a problem occur (interruption), it can be determined here.
⇒ **Error message**

Pic. 11.4.5

Test AML-Bus connection :
==========
Abort with ESC
No. of tests : 5

<3> : Resets the reagent-plasma-tray. All parameters are reset to their original values and the tray is moved to the reference position.

Pic. 11.4.6

Transmit softreset to reagent-plasma-tray :
==========
Please wait .....
Carry on with any key

<4> : Displays the status of all reagent-plasma-tray light barriers. Functionality check of the light barrier and the Lid query.

Pic. 11.4.7

```
Display light barrier status :
=====================

Abort with ESC !


          Light barrier reset rotor          : high
          Light barrier top                  : low
```

<5> : The reagent-plasma-tray carries out a test routine. The setup of the emergency cut off can be checked.
Should plasma tubes be placed in the sample tray, they can be read by the barcode scanner.

Pic. 11.4.8

```
Execute test routine :
=================

Abort with ESC !

          No. of tests :

          Position no. XX in ring no.   1    rotate to XYZZ !
```

<8> : The rotor can be turned by entering the position, which ring # and sample tube position.

Pic. 11.4.9

```
Move rotor :
==========

Move the tube to XYZZ or to Scanner (X/B) (E=Ende) :

Which ring should be positioned (1-5)                :

Which tube should be positioned (1-30)               :
```

<9> : Switches on the barcode scanner beam.

Pic. 11.4.10

```
Switch barcode scanner beam on :
==========================

Press <L> or <K> to switch beam on
<ESC> to abort !
```

<S> : After entering the ring and tube data, the barcode of the corresponding tube can be read.

Pic. 11.4.11

```
Read barcodes :
=============

Which ring shall be read (1-5)        :

Which vessel shall be read (1-30)   :
```

<I> : The module report of the barcode scanner can be read here (possible only when a barcode scanner of the old generation is installed).

Pic. 11.4.12

```
Query module report barcode scanner :
================================

Module report is :


Carry on with any key
```

<M> : The temperature of the reagent-plasma-tray is measured and displayed.

Pic. 11.4.13

```
Measure and display cooling temperature :
=================================

Abort with ESC !

          The current temperature is : 15.5 °C

          Minimum value  : 15.4

          Maximum value : 15.8
```

<R> : The rpm of the reagent mixer can be altered.

Pic. 11.4.14

```
Switch mixer on/off and adjust rotational speed :
====================================

Enter mixer rotational speed (1 - 20000, 0 = off) :
```

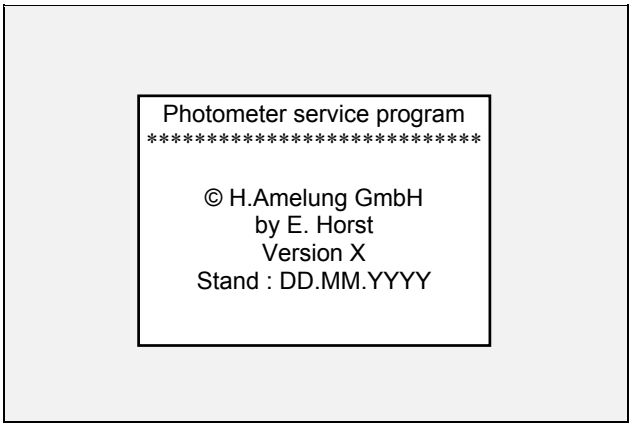
<E> : Exits the reagent-plasma-tray service program. The screen displays:

- - - AMAX service program main menu - - -

11.5 Photometer

<F6> opens the window “Photometer service program“ (Pic. 11.5.1)

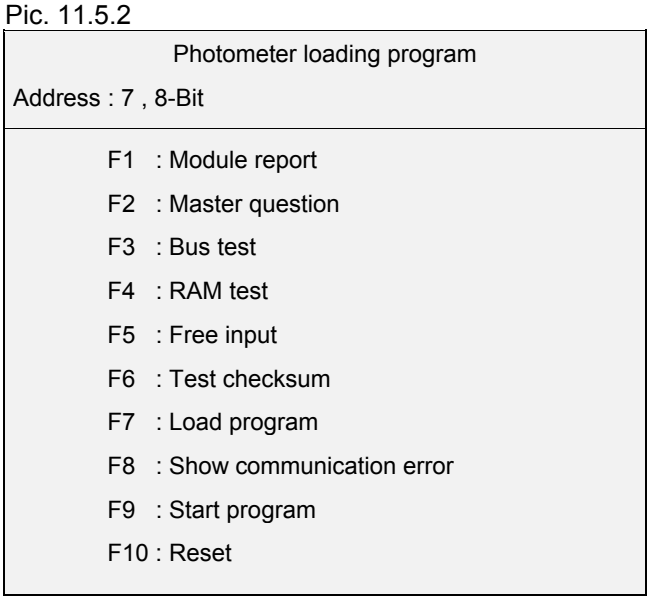
Pic. 11.5.1



The window with the photometer loading program opens. (Pic.11.5.2)

Use the function keys **<F1> - <F10>** for accessing each program parts.

Pic. 11.5.2



In the following sections, the display of each program part is described individually:

<F1> : The module report is displayed.

Pic. 11.5.3

```
Module report :

PHOTOMET 8-BIT XXXXXX  V X.X  NEUE RK
NEUES GERADE-VERFAHREN
NEUE CHROMOGEN-TABELLE   TEMPCORR
Kurzmeldung PHM VXX TT.MM.JJJJ
```

<F2> : The master question is queried here. The answer is displayed on the screen.

Pic. 11.5.4

```
                Answer master question : 2

0       B7 Last command is executed
0       B6 Communications error
0       B5 Channel error
0       B4 Temperature error
0       B3 Lamp error
0       B2 AD-converter error
1       B1 1 = load program 0 = measuring program
0       B0 Measured values can be queried
```

<F3> : Starts the AML-BUS test. The communication between the photometer and the commander PC is tested. Should a problem (interruption) occur, it can be determined here.
⇒ **Error message**

Pic. 11.5.5

```
How often shall the test be repeated ? X

No. of tests :

Number of error runs : X corresponds to  X.X%
```

<F4> : Tests the memory on board PH-O-RK (D02501).

This is irrelevant for service use.

Pic. 11.5.6

```
RAM test:

Please wait

RAM test:

RAM test OK
```

<F5> : A command in the hexadecimal format can be entered here.

This is irrelevant for service use.

Pic. 11.5.7

```
Order to transmit (in Hex) :
```

<F6> : The installed photometer program is checked.

This is irrelevant for service use.

Pic. 11.5.8

```
Test checksum:

Checksum OK
```

<F7> : The photometer program can be loaded manually. Enter:

photonp.bin

The program is being loaded. This is made visible by the running series of numbers.

Pic. 11.5.9

File name and path :

File name and path: photonp.bin

Line no.: 18
S11F41D47F4520FB41D008201942D0034C96454C5E

Program code is now loaded, OK !

IMPORTANT!
The program needs to be started only once, when the PH-O-RK board is taken into operation the first time. The user interface software program loads the program when booting. This enables automatic updating should a new version have been installed.

<F8> : Errors are displayed.

Pic. 11.5.10

Answer communications error : 0	
0	B7
0	B6
0	B5
0	B4
0	B3
0	B2
0	B1 Wrong command
0	B0 Wrong area

<F9> : The photometer measuring program is started.

Pic. 11.5.11

Photometer measuring program	
Address : 7 , 8-Bit	
F1	: Module report
F2	: Master question
F3	: Display communications error
F4	: Lamp control
F5	: Free input
F6	: Measurement
F7	: Every value
F8	: Measure temperature
F9	: Get chromogen time
F10	: Reset
ALT F1 : Bus test	ALT F2 Offset calibration

<F1> : The module reports are displayed.

Pic. 11.5.12

Module reports :
PHOTOMET 8-BIT XXXXX V X.X NEUE RK NEUES GERADE-VERFAHREN
NEUE CHROMOGEN-TABELLE TEMPCORRKANAL 8-11
Short message PHM V XX TT.MM.JJJJ
AD-converter ADW V XX TT.MM.JJJJ

<F2> : The master question is asked here. The answer is displayed on the screen.

Pic. 11.5.13

Answer master question : 8	
0	B7 Last command is executed
0	B6 Communications error
0	B5 Channel error
0	B4 Temperature error
1	B3 Lamp error
0	B2 AD-converter error
0	B1 1 = load program 0 = measuring program
0	B0 Measured values can be queried

<F3> : The errors are displayed here.

Pic. 11.5.14

Answer communications error : 8	
0	B7
0	B6
0	B5
0	B4
1	B3 Not ready

0	B2 Already occupied
0	B1 Wrong command
0	B0 Wrong area

<F4> : Here the current lamp status is displayed. The lamp can be switched to different conditions. A control error is displayed because the measuring program is activated but the lamp is not.

Pic. 11.5.15

Lamp status:	
0	B7
0	B6
0	B5
0	B4 Lamp temperature elevated
1	B3 Lamp control error
0	B2 Lamp on but not ready
0	B1 Lamp in Standby
0	B0 Lamp on
1 =	Lamp on
2 =	Lamp off
3 =	Lamp in Standby
Please enter	

<1> : Switches on the lamp. The (1) switches to B2. The lamp controller then sets the lamp to operation voltage (Control range between approx. 10-13.8 Volt). If the lamp voltage is inside of this range, the light switches to B0 (after approx. 90sec.) Is the lamp voltage outside of zone B0, the (1) switches to B3 lamp control error. In this case the lamp must be checked or replaced if necessary.

<2> : Switches off the lamp.

<3> : The lamp is switched to standby (the voltage is decreased).

Pic. 11.5.16

Order to send (in Hex) :

<F5> : A command in hexadecimal format can be entered here.

This is irrelevant for service use.

Pic. 11.5.17

Measuring
Channel 11 10 9 8 7 6 5 4 3 2 1 0
Occup. 0 0 0 0 0 0 0 0 0 0 0 0
1 = Determine blank value
2 = Abort off channel
3 = Start channel clotting
4 = Start channel chromogen
5 = Retrieve result
6 = show 4 channels (0-3)
7 = show 4 channels (4-7)
8 = show 4 channels (8-11)
9 = Values channel 0-7
A = Values channel 8-11

<F6> : Measurements can be started here. Also, the photometer can be adjusted here.

Please enter :

<F7> : One channel is displayed on the screen.
A determined value can be stored and viewed. The display values (reference voltage & multiplicator) can be changed as necessary.

Pic. 11.5.18

Transmit every value

Which channel (0-11) ?

12 = last measurement

13 = change file name

<F8> : The temperature of the photometer can be measured. The display can be altered with the keys **<+>** / **<->** (temperature display adjustment). A message (red characters) will indicate that the value was altered. Key **<0>** resets it to its original value.

Pic. 11.5.19

Measure temperature

37.5°C

0 + -

<F9> : Displays which chromogenic measuring mode is stored under a code number in the currently loaded photometer program.

Pic. 11.5.20

Display chromogen time

Which measuring mode ?

<F10> : Transmits a reset to the PH-O-RK board.

IMPORTANT!
The commands for adjusting the photometer amplifier will be described in detail in the following pages.

Adjusting the photometer

The photometer service program is needed to adjust the photometer. The following steps describe how to adjust the photometer measuring amplifier. This adjustment should be carried out in the instrument (photometer installed). The measuring unit has to be protected from any other light sources. The waste disposal drawer has to be closed. The photometer temperature and the lamp voltage have to be adjusted correctly.

Ensure the photometer temperature and voltage adjustments have to be carried out first.

8.5

The AMAX CS-190 has to be connected to the commander PC.

7.5

In order to adjust the measuring amplifier (amplifier compl. Q10150), the following instrument casings have to be removed:

Upper casing	**(123290)**
Side casing left	**(123289)**
Working area	**(123292)**

<F9> : Starts the photometer measuring program.

Pic. 11.5.21

Photometer measuring program

Address : 7 , 8-Bit

F1 : Module report
F2 : Master question
F3 : Communications error
F4 : Lamp control
F5 : Free input
F6 : Measurement
F7 : Every value
F8 : Measure temperature
F9 : Query chromogen time
F10 : Reset

ALT F1 Bus test ALT F2 Offset calibration

<F6> : The window “measurements” opens.

The keys **<6>, <7>, <8>** select the four / eight / twelve photometer channels.

Pic. 11.5.22

Measurements

Channel 11 10 9 8 7 6 5 4 3 2 1 0
Occup. 0 0 0 0 0 0 0 0 0 0 0 0

1 = Determine blank value
2 = Abort channel
3 = Start channel clotting
4 = Start channel chromogen
5 = Retrieve result
6 = Show 4 channels (0-3)
7 = Show 4 channels(4-7)
8 = Show 4 channels(8-11)
9 = Which channel 0-7
A = Which channel 8-11

Please enter :

Carry out the offset adjustment: The adjustment takes places at the measuring amplifier (amplifier compl. (Q10150)).

IMPORTANT!
The lamp has to be switched off.

<F6> : (see Pic. 11.5.22)

<6> :

Enter: 0

Pic. 11.5.23

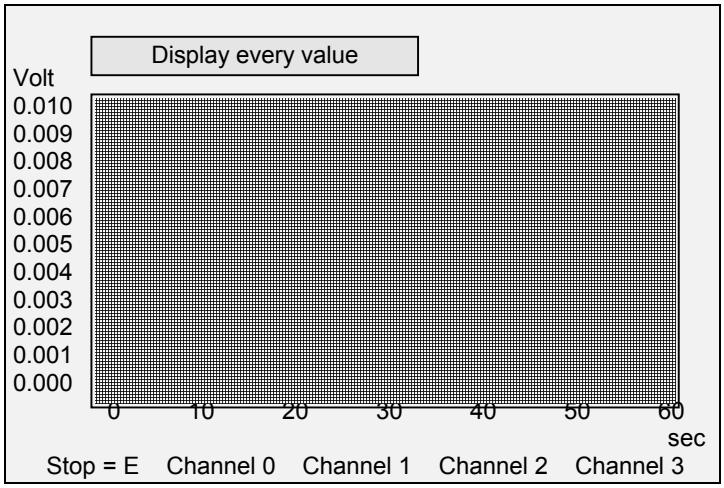
Base voltage ?

Multiplicator ?

Enter: 1000

The channels are displayed in a graphic. Using the offset potentiometer (lower potentiometer), the channels are adjusted so that all lines on the screen are positioned between 0 and 0.001 volts (approx. 5-10 digits). Actual value: 0.0005-0.001 Volt.

Pic. 11.5.24



1↱ = approx. + 4.5mV(approx. + 28 digits) /
1↰ = approx. - 4.5mV(approx. - 28 digits)

<9> : The digits (channel 0-7) are displayed.

Pic. 11.5.25

Channel 0 = 06
Channel 1 = 05
Channel 2 = 08
Channel 3 = 10
Channel 4 = 09
Channel 5 = XX
Channel 6 = XX
Channel 7 = XX

Carry out the amplifying adjustment: The adjustment takes place at the measuring amplifier (amplifier compl. (Q10150).

IMPORTANT!
There must be no cuvettes in the measuring channels. But first the lamp has to be turned on.

<F4> : With the menu ”lamp status”, the current lamp status can be queried. The lamp can be switched to different states.

Pic. 11.5.26

Lamp status:

0	B7
0	B6
0	B5
0	B4 Lamp temperature elevated
0	B3 Lamp control error
1	B2 Lamp on but not ready
0	B1 Lamp in standby
0	B0 Lamp on

1 = Lamp on
2 = Lamp off
3 = Lamp standby

Please enter

<1> : The lamp is turned on; it takes about 90 sec until the lamp is operational. The display then changes to “lamp on”. The lamp voltage should be approx. 11.0 ± 0.5 volts.
Otherwise, the voltage at the points X5 & X6 (lamp cable connection) can be measured and adjusted on the AM-O-LSR (D04301) board using the Potentiometer ***R50.***

1↱ = approx. - 200mV / **1**↰ = approx. + 200mV

<F6> : (see Pic. 11.5.22)

<6> :

Enter: 8.2

Pic. 11.5.27

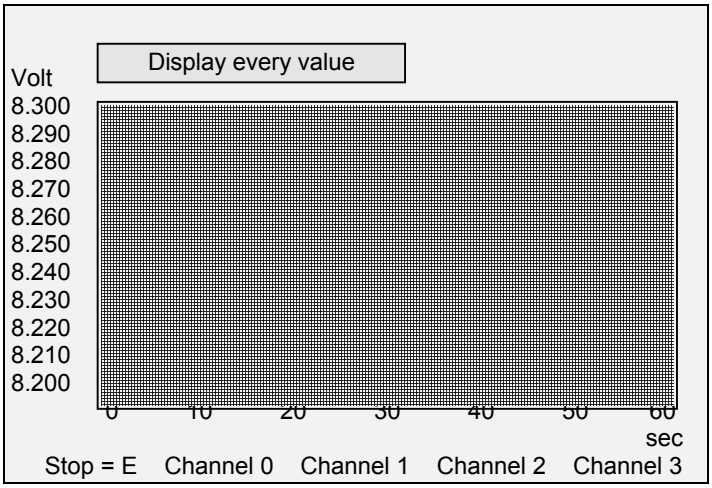
Base voltage ?

Enter: 100

Multiplicator ?

The channels are displayed in a graphic. Using the amplifier potentiometer (upper potentiometer), the channels are adjusted so that all lines on the screen level out at 8.25 volts (54000 digits).
Actual value:
8.25 ± 0.1 volts.

Pic. 11.5.28



1↱ = approx. + 225mV(approx. + 1800 Digits) /
1↰ = approx. - 225mV(approx. - 1800 Digits)

<9> : The digits (channel 0-7) are displayed.

Pic. 11.5.29

Channel 0 = 54122
Channel 1 = 54023
Channel 2 = 54321
Channel 3 = 54224
Channel 4 = 54522
Channel 5 = 54002
Channel 6 = 53922
Channel 7 = 53992

After the successful adjustment, the lamp can be switched back off again and the program can be ended.

IMPORTANT!
In the user software (main menu), the photometer now has to be calibrated.

11.6 XYZZ-Robot

<F1> opens the window “XYZZ-Robot Service Program“ (Pic. 11.6.1):

Pic. 11.6.1

```
************************************************************
*                                                          *
*                                                          *
*            XYZZ-ROBOT SERVICE PROGRAM                    *
*            ========================================      *
*                                                          *
*                                                          *
*                                                          *
*                                                          *
*            © MM/YY Heinrich Amelung GmbH                 *
*                                                          *
*            Written by A.Cramer                           *
*                                                          *
*            Machine : AMAX                                *
*                                                          *
*                                                          *
*            Carry on with any key !                       *
************************************************************
```

Picture 11.6.2 shows the window with all executable commands.

Pic. 11.6.2

```
            Service program XYZZ - robot CS-190

Program menu :
=============

A...Show current servo-axis position
M...Display module report
V...Test AML-Bus connection
R...Execute software reset
L...Display light barriers and liquid sensor
T...Execute test routine
Z...Process additional commands (next menu)
H...Test level sensor
D...Z-axis continuous test routine
E...End program

Please select :
```

Press keys ***<0> - <E>.***

<E> : Exits the XYZZ-robot service program.

The screen displays:

- - - AMAX service program main menu - - -

<A> : All current positions of the XYZZ-robot are displayed. All servo motors are powered off, the robot can be moved manually.

The positions displayed on the screen change.

(checking the encoders)

Pic. 11.6.3

```
Display current servo axis position :
============================

All servo motors turned off !
Abort with ESC !

        Current position X-axis      : 5962          174A

        Current position Y-axis      : 1200          04B0

        Current position Z1-axis     : 64            0040

        Current position Z2-axis     : 64            0040
```

<M> : Display of the module reports.

Pic. 11.6.4

```
The module reports are :
==================

AMAX  XYZZROB  PROTOTYP A:CRAMER


Module short message is :

Module: LRB Version: X Datum: DD.MM.YYYY

Carry on with any key
```

<V> : Starts the AML-BUS test. The communication between the XYZZ-robot and the command PC is checked. Should a problem (interruption) occur, it can be determined here.
⇒ **Error message**

Pic. 11.6.5

```
Check AML-bus connection :
=======================

Abort with ESC !

        Test runs : 5
```

<R> : Resets the XYZZ-robot. All parameters are reset to their original values and the robot is moved to its home position. (For testing the light barriers and the connection of the boards PH-XYZZ ⇒ PH-LSX)

Pic. 11.6.6

```
Transmit softreset to the XYZZ-robot :
============================
Please wait .....................

Carry on with any key
```

<L> : All light barriers and height sensor (level sensor) of XYZZ-robot are displayed.

Pic. 11.6.7

```
Display light barriers and liquid sensor :
==========================

Abort with ESC

        Light barrier X-reset position      : high

        Light barrier Y-reset position      : high

        Liquid sensor                       : low
```

<T> : The XYZZ-robot carries out a test routine.
The XYZZ-robot moves through all positions in sequence.

Pic. 11.6.8

```
Execute test routine :
=================

Abort with ESC !

        Move cuvette to : Mechanical measuring unit 0

Drive cycle no.: 0
```

IMPORTANT!
Ensure that the XYZZ-robot has loaded its t*each file.* Otherwise, some positions can't be reached correctly.
The safety cut-off could be activated**.**

11.12
8.6

ATTENTION!
Disregard might lead to malfunctions of and cause damage to the AMAX CS-190!

<Z> : Individual commands of the XYZZ-robot can be executed here.
No.1 displays a window.
(see Pic. 11.10.10)

Press keys ***<1> - <0>.***

Pic. 11.6.9

```
Work off other commands :
====================

1...Move to fix position
2...Lower Z1-axis to dispense position
3...Lower Z1-axis to washing position
4...Lower Z1-axis with liquid sensor
5...Lower Z2-axis to photometer position
6...Lower Z2-axis to ball position
7...Lower Z2-axis to waste cuvette disposal position
M..Extend Z2-axis carrier
8...Move Z-axis to origin position
0...Return to main menu

Please select:
```

IMPORTANT!
Not all combinations are possible: e.g. the command “lower Z1-axis” over a measuring unit will lead to a crash. The desired command should be selected with great care.

<0> : Exits the sub-program “Individual commands” and jumps back to the main menu “Select a sub-program”.

ATTENTION!
Disregard might lead to malfunctions of and cause damage to the AMAX CS-190!

<W> : Another window opens. Here a defined position can be selected with the keys **<1> - <33>**. The XYZZ-robot moves to these positions after the query, whether it should position the Z1- or the Z2-axis.
(see Pic. 11.6.11)

Pic. 11.6.10

Move to fix position

1 : Reag. rotor outer ring	20 : Incub. rail pos. 11
2 : Reag. rotor second ring	21 : Incub. rail pos. 12
3 : Reag. rotor third ring	22 : Photometer meas. cell 1
4 : Reag. rotor fourth ring	23 : Photometer meas. cell 2
5 : Reag. rotor inner ring	24 : Photometer meas. cell 3
6 : Well	25 : Photometer meas. cell 4
7 : Decontaminant	26 : Phm. intermediate pos. 1
8 : Well drain	27 : Phm. intermediate pos. 2
9 : Incub. rail ejector	28 : Phm. intermediate pos. 3
10 : Incub. rail pos. 1	29 : Phm. intermediate pos. 4
11 : Incub. rail pos. 2	30 : Mech. measuring cell 1
12 : Incub. rail pos. 3	31 : Mech. measuring cell 2
13 : Incub. rail pos. 4	32 : Mech. measuring cell 3
14 : Incub. rail pos. 5	33 : Mech. measuring cell 4
15 : Incub. rail pos. 6	
16 : Incub. rail pos. 7	
17 : Incub. rail pos. 8	
18 : Incub. rail pos. 9	
19 : Incub. rail pos. 10	

Enter fix position number :

<H> : The function and the accuracy of the level sensors can be checked here.

Should the level sensors not work properly (tolerance of 50 increments is exceeded), the element has to be aligned once more.

Pic. 11.6.11

```
Test capacitance level sensor:
==========================

Abort with ESC !

Current Z-value :                    2696
Average value :                      2696
Current deviation:                   0
Deviation > 50 Increments :          0
Test runs :                          24
```

⇒ **Possible error**:

- breakage of the Coax cable
- wrong adjustment
- defect PH-LSX board
- Z-axis guiding block is dirty.
- Tubing guide is not seated correctly.

8.6

<D> : Both Z-motors execute a test routine. Possible changes of position can be determined.

Pic. 11.6.12

```
Test both Z-axes :
==============

Please remove the cover and the inlays from the RPB-tray!
Carry on with any key

Abort with ESC !

          Drive cycle no.: 1
```

<E> : Exits the XYZZ-robot service program. The screen displays:

- - - AMAX service program main menu - -

11.7 Liquid Management

<F5> opens the window “Liquid Management Service Program (Pic. 11.7.1):

Pic. 11.7.1

```
*****************************************************************
*                                                               *
*                                                               *
*              LIQUID  MANAGEMENT  SERVICE  PROGRAM             *
*              ====================================             *
*                                                               *
*                                                               *
*                                                               *
*              © MM/YY Heinrich Amelung GmbH                    *
*                                                               *
*              Written by A.Cramer                              *
*                                                               *
*              Machine : AMAX                                   *
*                                                               *
*                                                               *
*              Carry on with any key                            *
*****************************************************************
```

Picture 11.7.2 shows each window’s executable commands.

Press keys ***<P> - <E>.***

Pic. 11.7.2

```
          Liquid management service program AMAX

Program menu :
==============

P...Adjust rotational speed of hot water circulation pump
M...Display module report
B...Test AML-Bus connection
R...Execute software reset
F...Display liquid level sensors
A...Waste water pump on/off
L...Switch signal lamps
T...Measure and show temperatures
E...End program

Please select :
```

<P> : Adjusts the rpm of the reciprocating pump.
(0 = pump off / 255 = pump on full throughput)

Pic. 11.7.3

```
Adjust rotational speed of reciprocating pump:
==============================================

Abort with ESC

1...Adjust no. of strokes hot water circuit pump

No. of strokes hot water circuit pump (0 - 255) :
```

<M> : Displays the module report.

Pic. 11.7.4

```
Module reports are :
================

AMAX    WASSER    PROTOTYP A:CRAMER

Module short message :

Module: WKL Version: X Datum: DD.MM.YYYY

Carry on with any key
```

<B> : Starts the AML-BUS test.

The communication between the water circuit and the command PC is checked. Should a problem (interruption) occur, it can be determined here.
⇒ **Error message**

Pic. 11.7.5

```
Check AML-Bus connection :
======================

Abort with ESC

Test runs : 5
```

<R> : Resets the water circuits. All parameters are restored to their original values.

Pic. 11.7.6

```
Send softreset to the water circuits :
============================

Please wait .....

Carry on with any key
```

<F> : Fluid level sensors of all of the water circuits are queried and displayed. This is the display when the instrument is in a perfect condition. Functionality checks of the fluid level sensors.

Pic. 11.7.7

```
Display liquid level sensors :
======================
Abort with ESC

        Hot water circuit       : full
        Cooling water circuit   : full
        Well XYZZ-robot         : empty
        Fresh water reservoir   : full
        Waste water reservoir   : empty
        Reserve tank top        : full
        Reserve tank bottom     : full

        Bit 3 : empty

        Decimal format    : 248
```

<A> : Starts the waste water pump of sub-assembly (Q10013). If necessary the filled well can be drained this way.

Press key ***<x>.***

Pic. 11.7.8

Waste water pump on/off :
==========
Abort with ESC !
x : Start waste water pump for the well XYZZ-robot

<L> : The traffic light lamps are switched on and of in sequence.

Pic. 11.7.9

Switch signal lamps:
==========
Abort with ESC !
Green lamp on

2.2

<T> : The temperature of the warm water / cooling water circuits are measured and displayed.

Pic. 11.7.10

Measure and display temperatures :
==========

Abort wi

Temperature warm water circuit : 40.5 °C

Temperature cooling water circuit : 32 °C

Temperature incubation rail : 37.4 °C

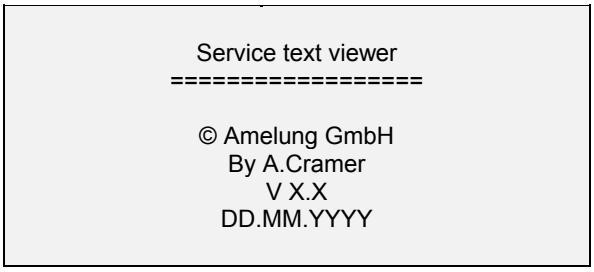
<E> : Exits the water circuit service program. The screen displays:

- - - AMAX service program main menu - - -

11.8 Text Viewer

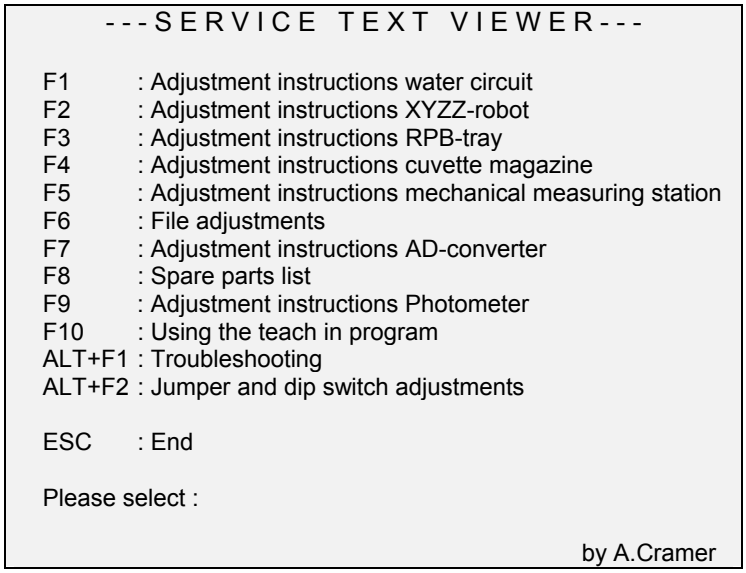
Pressing **<ALT+F7>** starts the ”Service text viewer”.

Pic. 11.8.1



Pressing the function keys **<F1> - <F10>**, **<ALT+F1> & <ALT+F2>** starts each program.

Pic. 11.8.2



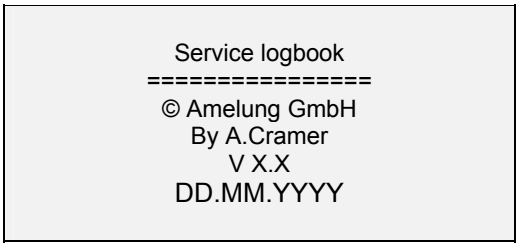
- **<F1> , <F2> , <F3> , <F4> , <F5>** : Setup parameters for each module.
- **<F6>** : Opens “Adjustments in files“. All parameters which can be adjusted under DOS in the user software (main menu) are displayed here. These adjustments should be carried out only by trained service technicians in order to avoid malfunction of the AMAX CS-190.
- **<F7>** : Adjustments instructions for the AD-converter**.**
  This is irrelevant for service use.
- **<F8>** : Displays the spare parts list of the AMAX CS-190. All parts which are necessary for the repair and maintenance of the AMAX CS-190 are listed there.
- **<ESC>** : Exits the service text viewer and the screen displays:

  - - - AMAX service program main menu - - -

11.9 Service Logbook

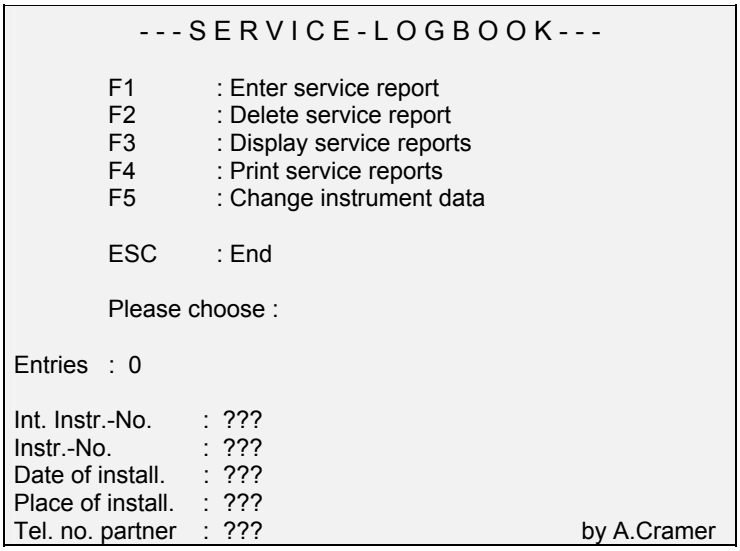
Pressing **<ALT+F6>** starts the “Service logbook“.

Pic. 11.9.1



Pressing the keys **<F1> - <F5>** starts each program.

Pic. 11.9.2



<F1> : Add a service report to the list.
<F2> : Deletes the highlighted entry from the list.
<F3> : Shows all service reports.
<F4> : Prints the service reports. You can choose between printing the whole list and printing selected reports only.
<F5> : The instrument data has to be entered here. The int. Device No. can be found behind the waste disposal drawer. It is printed on the base frame. The Device No. is printed on the instrument series number lable.

IMPORTANT!
The service logbook should be created after every instrument installation. Every service intervention should be entered in the logbook.

<ESC> : Exits the service logbook program. The screen displays:

- - - AMAX service program main menu - - -

11.10 AMAX Teach in Program

The XYZZ positions are aligned by using the XYZZ teach in program. The robot moves to the positions using predefined data, but the correct positions differ from instrument to instrument ⇒ **Tolerance.**

With this program, the positions can be adjusted in such a way that the Z-axes can move precisely to all instrument positions (e.g. to drive exactly into the middle of a vial opening).

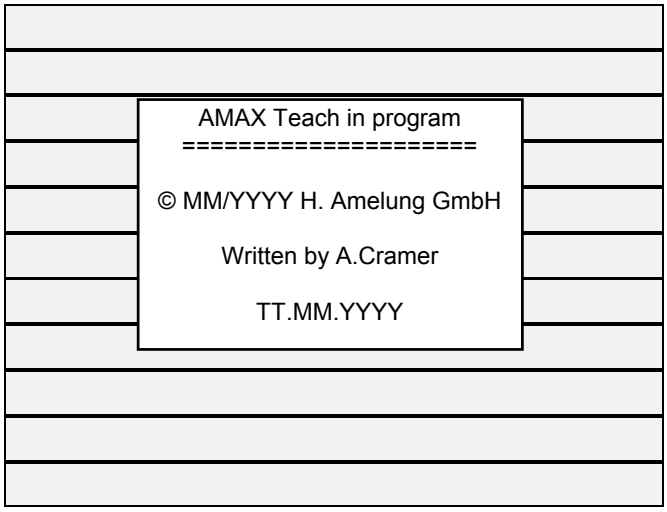
NOTICE!
The mechanical reset switch of the robot has to be activated.

8.6

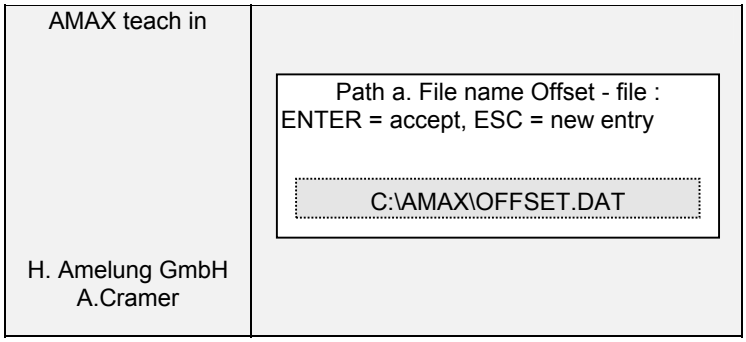
ATTENTION!
Disregard may lead to malfunctions of and cause damage to the AMAX CS-190!

Pressing **<F8>** starts the service program ”AMAX teach in program“.

Pic. 11.10.1



Pic. 11.10.2



The path and file name can be altered here.

A suggestion, which can be used, is already entered.

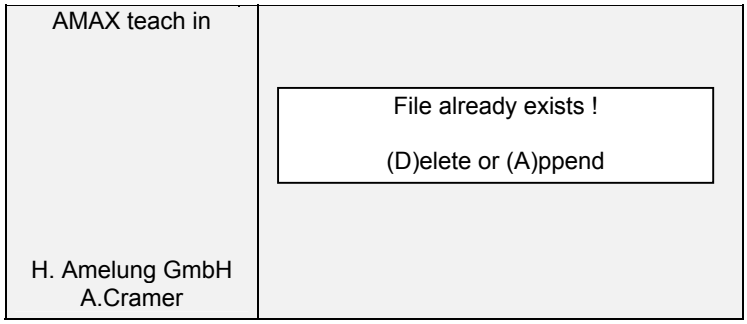
<ESC> : deletes the entry.
<ENTER> : accepts the entry.

The file ”OFFSET.DAT“ is created. In this example, it already exists.

<L> : deletes the file. All data is lost. In this case, the teach in program has to be carried out completely.

<A> : The data is attached (appended). Individual positions can be altered (aligned).

Pic. 11.10.3



The pointer (=>) makes the selection.
It can be moved with the <↓>, <↑> keys on the PC keyboard.

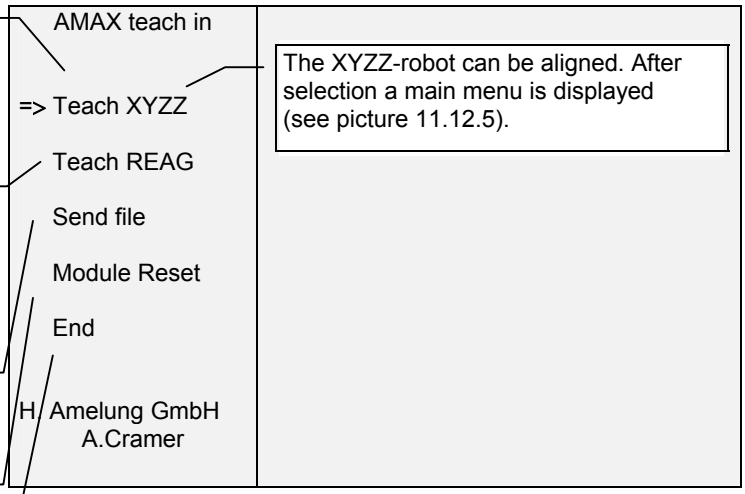
The reagent-plasma-tray can be aligned.
This is irrelevant for service use.

The file ”OFFSET.DAT“ is transmitted. After a reset, the data has to be transmitted in order to provide the robot with its position data.

The module XYZZ-robots and the reagent-plasma-tray carry out a reset.

Ends the AMAX teach in program.

Pic. 11.10.4

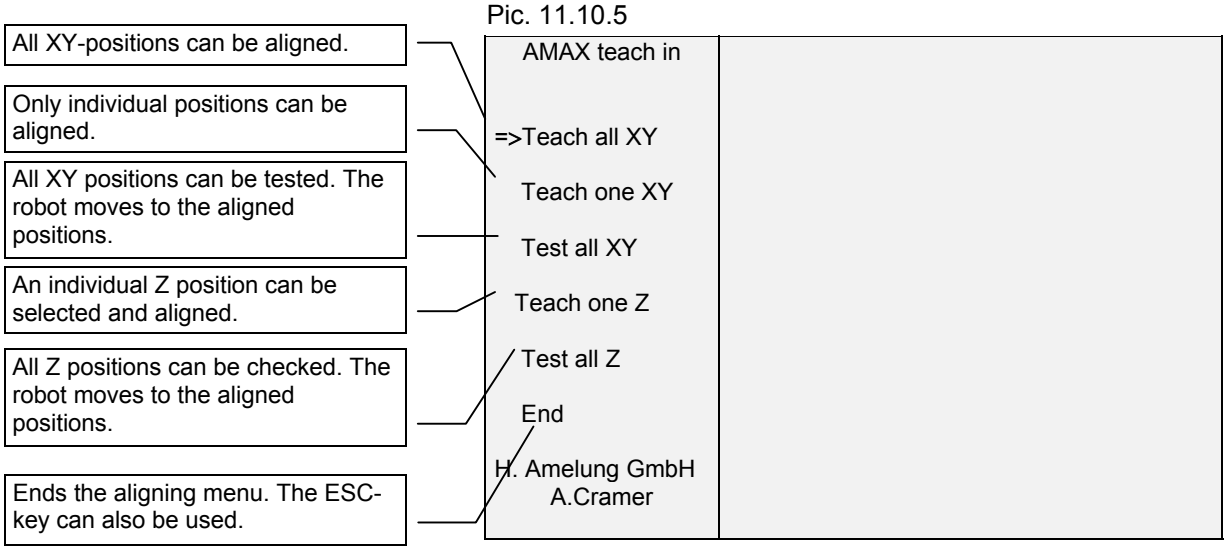


IMPORTANT!

The following points have to be carried out before the aligning.

1. XYZZ reset
2. Wait until the XYZZ robot has reached his reference position.
3. Send file.

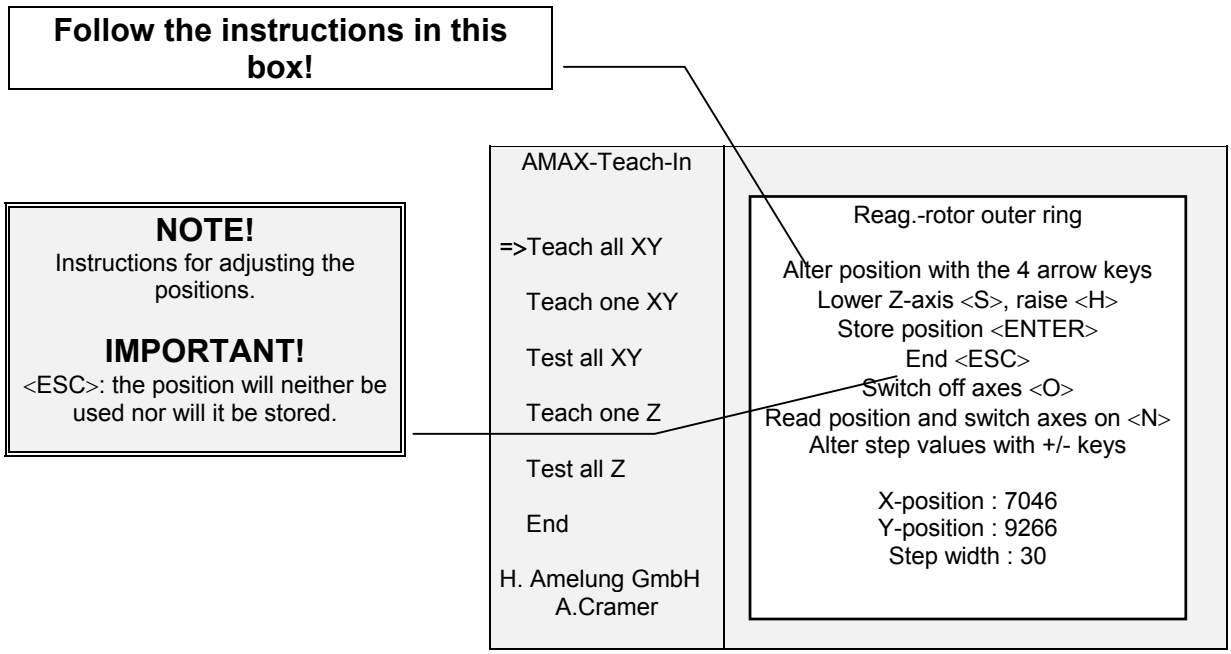
Pic. 11.10.5



...Teach all XY positions: the XYZZ-robot moves to all XY-positions in sequence.

There is a window for every position: Example in picture 11.10.6.

Pic. 11.10.6



Before the XY-positions can be aligned, the offset for the Z1 / Z2-axis has to be adjusted **first**.
Select the point: ”Align a Z-axis“ (Picture 11.10.5(6))
Offset Z1 / Z2 Axis is loaded. The XYZZ-robot moves with the Z1-axis to the position (mechanical measuring cell 4).

The Z-axis lowers. It should to be in the center of the measuring cell, otherwise, the position has to be corrected. When the axis has reached its position, confirm with **<ENTER>** and the Z2-axis moves into the measuring cell. This position also has to be corrected if necessary. Confirm with **<ENTER>.** This program point has been completed and the window “teach in” appears (Picture 11.10.5(6)).

Now, the XY position can be aligned. In addition, all positions can be aligned manually. This means that the XYZZ-robot is moved to the desired positions manually after its motors have been switched to “power off”. The position is read in by pressing **<N>** and the motors are switched back on. **<ENTER>** stores the position.

When all XY-positions are adjusted, the Z-positions can now be adjusted.

IMPORTANT!
Do not adjust the offset Z1 / Z2-axis any more.

After successfully aligning the XYZZ-positions, end the program by executing the command “end”. Only then is the file stored on the hard disk of the commander PC.

The screen displays:

- - - AMAX service program main menu - - -

ATTENTION!
Disregard may lead to malfunction and cause damage to the AMAX CS-190.

11.10.1 Adjustable XY-Positions

Tab. 11.10.1.1

Position *XY-positions*	Axis	Position to be aligned
Reag. rotor outer ring	Z1	Center of vial
Reag. rotor second ring		
Reag. rotor third ring		
Reag. rotor fourth ring		
Reag. rotor inner ring		
Well (align ejector)	Z1 (Z2)	The XY-position must be aligned so that it matches the pick up position for a cuvette in the incubation rail, (incub. rail ejector) position.
Decontaminant	Z1	Adjust the XY-position so that the Z1-axis can move into the decontamination reservoir position.
Well drain	Z1	Adjust the XY-position so that the Z1-axis moves directly over the drain.
Incub. rail ejector	Z2	Adjust the XY-position so that the Z-axis (cuvette ejector, tappet) can move **into** the opening of the incubation rail.
Incub. rail position 1	Z1	Center of the opening in the incubation cover
Incub. rail position 2		
Incub. rail position 3		
Incub. rail position 4		
Incub. rail position 5		
Incub. rail position 6		
Incub. rail position 7		
Incub. rail position 8		
Incub. rail position 9		
Incub. rail position 10		
Incub. rail position 11		
Incub. rail position 12		
Photometer meas. channel 1	Z2	Adjust the XY-position so that the Z-axis (cuvette ejector, tappet) can move **into** the measuring cell
Photometer meas. channel 2		
Photometer meas. channel 3		
Photometer meas. channel 4		
Photometer intermediate pos. 1	Z2	Adjust the XY-Position so that the carrier can open the measuring channel cover. The carrier should be positioned approx. 3 mm beside the opener of the measuring channel cover.
Photometer intermediate pos. 2		
Photometer intermediate pos. 3		
Photometer intermediate pos. 4		
Mech. meas. channel 1	Z2	Adjust the XY-position so that the Z-axis (cuvette ejector, tappet.) can move **into** the measuring channel.
Mech. meas. channel 2		
Mech. meas. channel 3		
Mech. meas. channel 4		

All XY-positions listed in Tab 11.10.1.2 are default values.
The default values are used by the software without the file ”OFFSET.DAT“. The positions can be altered by aligning.

Tab. 11.10.1.2

Position	Default-values
Reag. rotor outer ring	X-position : 7046 / Y-position : 9266
Reag. rotor second ring	X-position : 5592 / Y-position : 10473
Reag. rotor third ring	X-position : 3146 / Y-position : 12260
Reag. rotor fourth ring	X-position : 2455 / Y-position : 12933
Reag. rotor inner ring	X-position : 488 / Y-position : 14414
Well (align ejector)	X-position : 5962 / Y-position : 1202
Decontaminant	X-position : 1954 / Y-position : 1202
Well drain	X-position : 4770 / Y-position : 1202
Incub. rail ejector	X-position : 8056 / Y-position : 1370
Incub. rail position 1	X-position : 9706 / Y-position : 1238
Incub. rail position 2	X-position : 11510 / Y-position : 1238
Incub. rail position 3	X-position : 13312 / Y-position : 1238
Incub. rail position 4	X-position : 15095 / Y-position : 1238
Incub. rail position 5	X-position : 16919 / Y-position : 1238
Incub. rail position 6	X-position : 18684 / Y-position : 1238
Incub. rail position 7	X-position : 20486 / Y-position : 1238
Incub. rail position 8	X-position : 22279 / Y-position : 1238
Incub. rail position 9	X-position : 24091 / Y-position : 1238
Incub. rail position 10	X-position : 25886 / Y-position : 1238
Incub. rail position 11	X-position : 27682 / Y-position : 1238
Incub. rail position 12	X-position : 29476 / Y-position : 1238
Photometer meas. channel 1	X-position : 22294 / Y-position : 3919
Photometer meas. channel 2	X-position : 22906 / Y-position : 6330
Photometer meas. channel 3	X-position : 22933 / Y-position : 8774
Photometer meas. channel 4	X-position : 22978 / Y-position : 11196
Photometer intermediate pos. 1	X-position : 18033 / Y-position : 3919
Photometer intermediate pos. 2	X-position : 18033 / Y-position : 6330
Photometer intermediate pos. 3	X-position : 18033 / Y-position : 8774
Photometer intermediate pos. 4	X-position : 18033 / Y-position : 11196
Mech. meas. channel 1	X-position : 17405 / Y-position : 14418
Mech. meas. channel 2	X-position : 22019 / Y-position : 14416
Mech. meas. channel 3	X-position : 26569 / Y-position : 14416
Mech. meas. channel 4	X-position : 31133 / Y-position : 14417

11.10.2 Adjustable Z-Positions

When all XY-positions are adjusted, the Z-Positions can be adjusted.

IMPORTANT!
Do not adjust the offset Z1 / Z2-axis any more.

Tab. 11.10.2.1

Offset Z1/Z2-axis:

Before the XY-positions can be aligned, the offset of the Z1 / Z2-axis should be adjusted.
First the Z1-axis moves to the position mechanical measuring cell 4.
Adjustment: axis in the center of the measuring cell.
Then the Z2-axis moves to the position.
Adjustment: ejector in the center of the measuring cell.

Z2-axis ejector extended:

will not be aligned

Z2-axis photometer:

- switch axes to power off
- push the ejector (Z2-axis) onto the black plastic part of the measuring cell and set the reference position to 0. Move the robot over the measuring cell and push the Z2-axis into the measuring cell until the reference position display says 8.8mm (8.75-8.85).

This position no longer requires adjustment. The position is adjusted automatically with the **service program** “photometer auto align”.
After the adjustment with the **service program** “photometer auto align” this command **should not** be executed any more, otherwise the stored position would be overwritten.

11.17

Z2-axis measuring cell:

- switch axes to power off
- put a cuvette into the measuring cell and move the ejector (Z2-axis) on top of it. Switch on Z-axis and set reference position to 0. Next lower the Z2-axis 1mm with the arrow key **<↓>.**

Z2-axis ejection:

Move the Z2-axis to the mechanical stops using the arrow key **<↓>** (reference position does not change any more). Set the reference position to 0.00m with the **<R>** key. Next raise the Z1-axis 2mm with the arrow key **<↑>.**

Z1-axis dispense in incubation rail and measuring channel: Lower the Z1-axis so far with the arrow key **<↓>** that the groove of the needle heating touches the top edge of the rail cover.
Z1-axis washing in wash-well: Move the Z1-axis down until it touches the floor of the well insert (using the arrow key **<↓>).** Set reference position to 0.00mm using the **<R>** key. Next raise the Z1-axis 2m using the arrow key **<↑>**.

All Z-positions in Tab. 11.10.2.2 are default values.
The default values are used by the software without the file ”OFFSET.DAT“. The positions can be altered by aligning.

Tab. 11.10.2.2

Position	Default-values
Z2-axis ejector out	Z-position : 215
Z2-axis photometer	Z-position: 1273
Z2-axis measuring channel	Z-position: 1350
Z2-axis ejection	Z-position: 1664
Z1-axis dispense in incubation rail and measuring channel	Z-position: 795
Z1-axis washing in wash-well	Z-position: 623
Offset Z1/Z2-axis	1.X-position: 31133/ 2.X-position: 29183

To check the file ”OFFSET.DAT“ start the ***service program*** “AMAX teach in program“ by pressing **<F8>.**

First the XYZZ-robot executes a reset (Pic. 11.10.4). The file will be loaded after the reset is completed (Pic. 11.10.4). Once the file is loaded, the XY-positions can be checked by selecting the menu point ”Check all XY” (Pic. 11.10.5(6)).

The XYZZ-robot moves to all XY-positions ⇒ If an adjustment is imprecise, it has to be corrected. If they are correct, the Z-positions can be checked by selecting the menu point “Check all Z” (Pic. 11.10.5(6)).

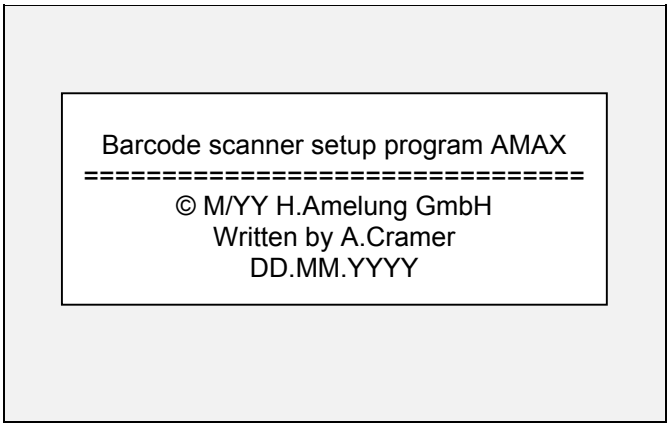
The XYZZ-robot moves to all Z-positions ⇒ If an adjustment is imprecise, it has to be corrected.

ATTENTION!
Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

11.11 Barcode Setup

<F10> opens the window Barcode setup AMAX CS-190 (Pic. 11.11.1)

Pic. 11.11.1



<A> - <O> : Each barcode can be selected (switched on or off)

<Q> : Exits the program and stores the setup.

Pic. 11.11.2 Setup example

--- Barcode scanner setup AMAX ---

A UPC VD	√	I CODE 11	-
B UPC/EAN	√	J CODE 39	-
C CODABAR ABC	-	K CODE 128	-
D CODABAR	√	L 1. INT2/5	8
E INT2/5	√	M 2. INT2/5	6
F DIS2/5	√	N 1. DIS2/5	6
G CODE 39 FULL	-	O 2. DIS2/5	8
H CODE 39	√		
		Q QUIT	

Use keys A - O to alter adjustments, Q to end the program and store data

The screen displays:

- - - AMAX service program main menu - - -

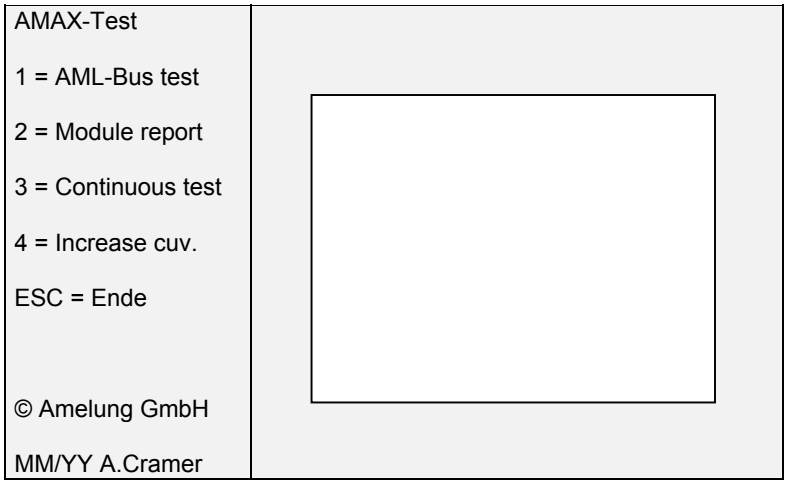
IMPORTANT!
The barcode setup program was created only for a particular barcode scanner generation. Should the program not be accessible, the installed scanner does not need to be adjusted.

11.12 AMAX Continuous Test Program

Pressing **<ALT+F3>** starts the ”AMAX continuous test program“.

A window, in which multiple functions can be selected, appears.

Pic. 11.12.1



First, all programs execute a reset. Then, all needed data will be loaded (teach files etc.).

When the screen resembles Pic. 11.12.1, each program can be selected with the corresponding key.

<1> :	AML-BUS test	The complete BUS system is checked. Should an error occur, it will be displayed.
<2> :	Module report	All module reports are displayed on the screen.
<3> :	Continuous test	This program initiates all modules. Its purpose is to simulate a sequence which corresponds to a real measuring process (main software).
<4> :	Increase cuv.	The modules magazine, XYZZ-robot and measuring cells are initiated by this program. Its purpose is to transport cuvettes from the cuvette magazine to any measuring point using the XYZZ-robot.
<ESC> :		Exits the service program “Continuous test“ and the screen displays:

- - - AMAX service program main menu - - -

11.13 AMAX Continuous Test II

Pressing **<ALT+F8>** starts the service program ”Continuous test II“.

IMPORTANT!
There should be no cuvettes in the robot gantry. If the barcode scanner is also to be checked, a tube with a barcode should be placed in the sample tray position 1. The file OFFSET.DAT has to be in the directory C:\AMAX.

ATTENTION!
Disregard can lead to malfunction of and cause damage to the AMAX CS-190!

All modules are initiated with this program. Its purpose is to check each module individually. This test is stored in a file. This file can be opened and read at a later time.

The name of the file is:

AMAXTEST.LOG

It is in the directory: **C:\AMAX\SERVICE**

Opening the file: Screen displays: **C:\AMAX\SERVICE**
Enter: **EDIT AMAXTEST.LOG**

- In contrast to the service program ”AMAX self test program” this program works continuously.
- The number of tests is displayed on the screen.
- An information line shows every step of the tests.
- The program can be aborted by pressing the **<ESC>** key.
- When an error has been determined, the program immediately aborts at the point where the error has occurred. The error message is displayed in **red**.
- When no errors have occurred, the program carries on until all modules have been tested once. Then the test cycle starts over.
- Pressing **<ESC>** aborts the program, the screen displays:

- - - AMAX service program main menu - - -

11.14 AMAX Self Test Program

Pressing **<F9>** starts the ”Self test program“.

IMPORTANT!
There should be no cuvettes in the robot arm transfer unit. A plastic vial, which is filled with water (ca. 4cm high), has to be placed in the decontaminant position: If the barcode scanner is also to be checked, a tube with a barcode should be placed in sample tray position 1. The file OFFSET.DAT has to be in the directory C:\AMAX.

ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

All modules are initiated with this program. Its purpose is to check each module individually. This test is stored in a file. This file can be opened and read at a later time.

The name of the file is:

AMAXTEST.LOG

It is in the directory: **C:\AMAX\SERVICE**

Opening the file: Screen display says: **C:\AMAX\SERVICE**

Enter: **EDIT AMAXTEST.LOG**

- An information line shows every step of the tests.
- When an error has been determined, the program immediately aborts at the point where the error has occurred. The error message is displayed in **red**.
- When no errors have occurred, the program carries on until all modules have been tested once. The message “No errors have been found in the system“ is then displayed and the software switches back to the menu.
- **<ENTER>** : Exits the program and the screen displays:

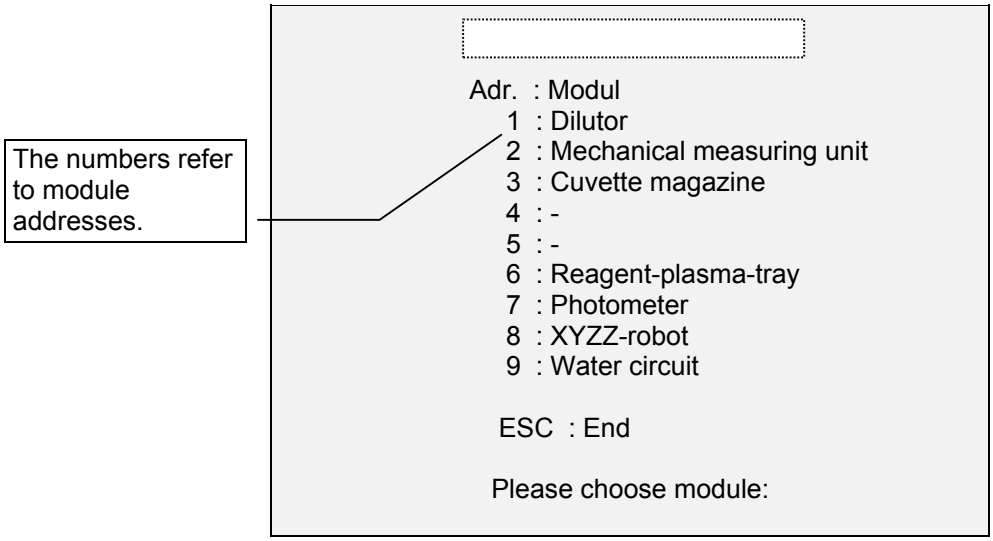
- - - AMAX service program main menu - - -

11.15 Error Codes

Pressing **<ALT+F1>** starts the ”Error codes“.

The window error codes CS-190 (Pic. 11.15.1) is displayed on the screen.

Pic. 11.15.1



When selecting a module, you will be asked whether you want to decipher an error code or if you want to inquire an error via the AML-Bus.

- When entering an error code, the description of the error code appears on the screen.
- When making a query using the AML-bus, the description appears on the screen after the corresponding module has been scanned.

Entering the number 20 exits the program. The screen displays:

- - - AMAX service program main menu - - -

11.16 AD Converter

Pressing **<ALT+F2>** starts the ”AD converter“.

This program cannot be executed. A special board is needed to connect the AD converter.

<ESC> : Exits the ”AD converter“ and the screen displays:

- - - AMAX service program main menu - - -

11.17 Photometer Auto Align

Pressing **<ALT+F10>** starts the ”Photometer auto align“.

This program is used to automatically adjust the setup of the Z-axis photometer position.

The adjustment tool (J01817) is placed into the front photometer measuring cell with the hole facing down.
The adjustment gauge is used to find the highest light intensity. Once this value has been found, the Z-axis position is stored when the program is ended by pressing **<j>.**

Pic. 11.17.1

```
VX.X DD.MM.YYYY
Automatic alignment photometer depth :
==============================

Please insert the adjustment gauge into the photometer
channel nearest to you (user position in front of the
instrument), level with the black edge of the measuring
channel so that the cover can just be closed.
The surface of the adjustment gauge with the hole must
be inserted first!
Please clean the waste disposal drawer because the
gauge will fall into it!
Proceed with F1, abort with ESC
Measure photometer depth setting
Z-position : XXXXX Light intensity : XXXXX
calculating measuring results...
best Z-position : XXXXX
Should this value be stored in the Teach-in file?
Choose :Y / N
```

ATTENTION!
The waste drawer has to be cleaned because the adjustment gauge falls into it after the adjustment.
RISK OF INFECTION!

IMPORTANT!
The position “Z-axis photometer position” should not be aligned in the AMAX teach in program any more. Otherwise, the position, which has been aligned in this program would be overwritten.

11.18 Drip Test

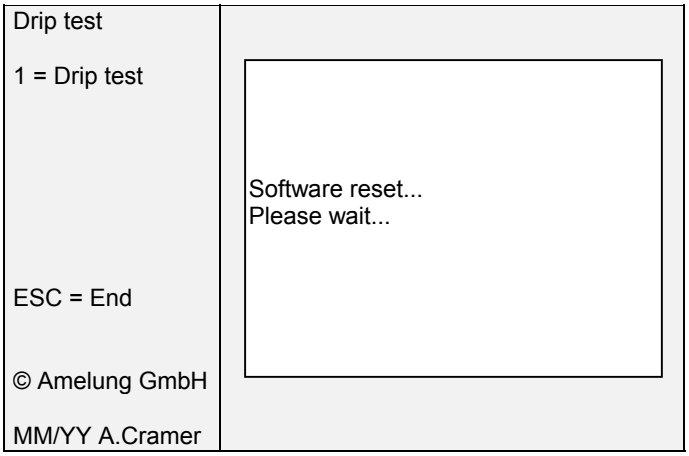
Pressing **<ALT+F9>** starts the ”Drip test“.

This program is used to check for leakages in the pipetting system. A water drop is formed at the end of the needle. It must not change its size or fall off. Otherwise, the system has a leak which may cause differences in volumes while pipetting.

⇒ **Precision problems**

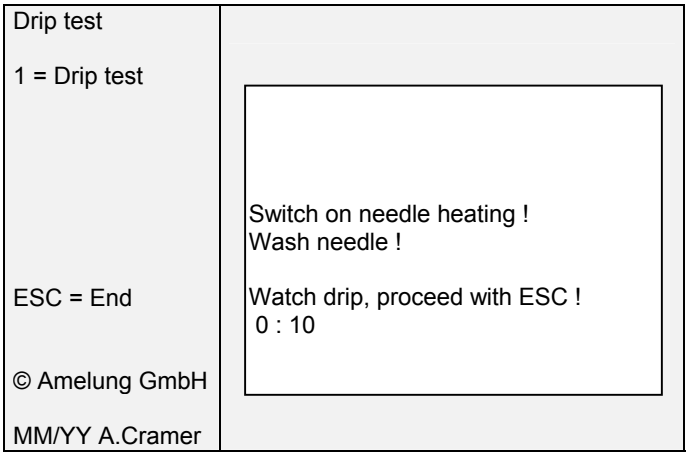
<ALT+F9>
After the start of the program the modules execute a reset.
Then, all necessary files are loaded (e.g. OFFSET.DAT etc.).

Pic. 11.18.1



<1> : starts the drip test.
The needle heating is turned on (pump) and the needle is washed. Then, a water drop is formed at the end of the needle. At the same time a timer is started.

Pic. 11.18.2



ATTENTION!
Disregard can lead to malfunction of the AMAX CS-190!

12. Troubleshooting

12.1 Error Examples 12 – 1

12.1 Error Examples

Tab. 12.1.1

Cause	Effect	Corrective action
AMAX CS-190 does not start up		1. Check the power supply plugs 2. Check the wall socket for voltage
AMAX CS-190 is turned on, but the program doesn't start	No measurement possible	1. Is the PC switched on? 2. Is the connection between the PC and AMAX CS-190 established ? (BUS-cable) 3. Is the program installed?
Instrument becomes too hot	Error message is displayed	1. Check air filter, clean if necessary 2. Check system fluid, refill if necessary 3. Check fluid filter (blockage), replace if necessary
Some temperatures aren't achieved	Error message is displayed	1. Check air filter, clean if necessary 2. Check system fluid, refill if necessary 3. Check fuses in the instrument 4. Check heating, cooling 5. Check system fluid, refill if necessary
There is water under the AMAX CS-190		1. Check the waste and fresh water connections 2. Check drain well for blockage 3. Is the waste water pump working? 4. Tubing defect?
XYZZ-robot is out of order after some time	Error message is displayed	1. Check tension of the drive belts 2. Check positions (teach in) 3. Check movabilitiy of all axes and guides, lubricate if necessary 4. Check safety cutoff (voltage)
Mech. meas. unit: Not all knee joints close	Error message is displayed	1. Check disposal drawer (full) 2. Check, if cuvettes have jammed behind the holdings springs in the measuring cells 3. Check functioning of light barrier stepper motor (knee joint)

Cause	Effect	Corrective action
Bubbles in tubing (XYZZ)	Test values out of acceptable range	1. Check integrity of dilutor syringe 2. Check integrity of all connections and joints
Water leakage at the dilutor valve	Test values out of accept out of acceptable range	1. Check dilutor needle tubing set for blockage 2. Check needle for blockage
Photometer cannot be adjusted electrically. Range of the potentiometer is insufficient.	Test values out of acceptable range	1. Clean photometer optics 2. Check lamp voltage, replace lamp if necessary
Photometer lamp cannot be turned on in the main menu	Report error photometer lamp	1. Check photometer lamp 2. Check fuses

13. Drawings

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Dilutor Circuit Diagram	13 – 2
Dilutor	13 – 3
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Base Unit	13 – 32
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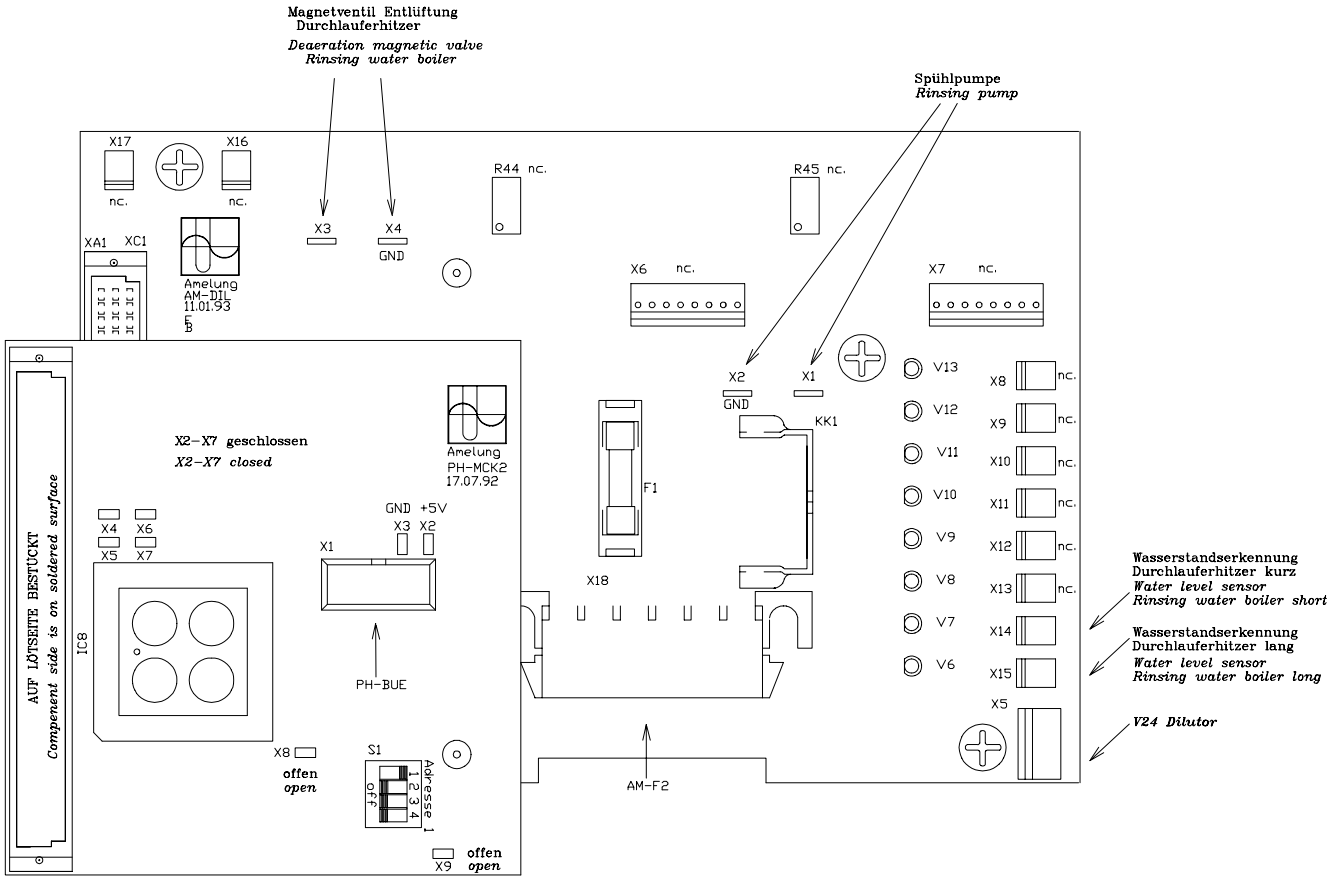
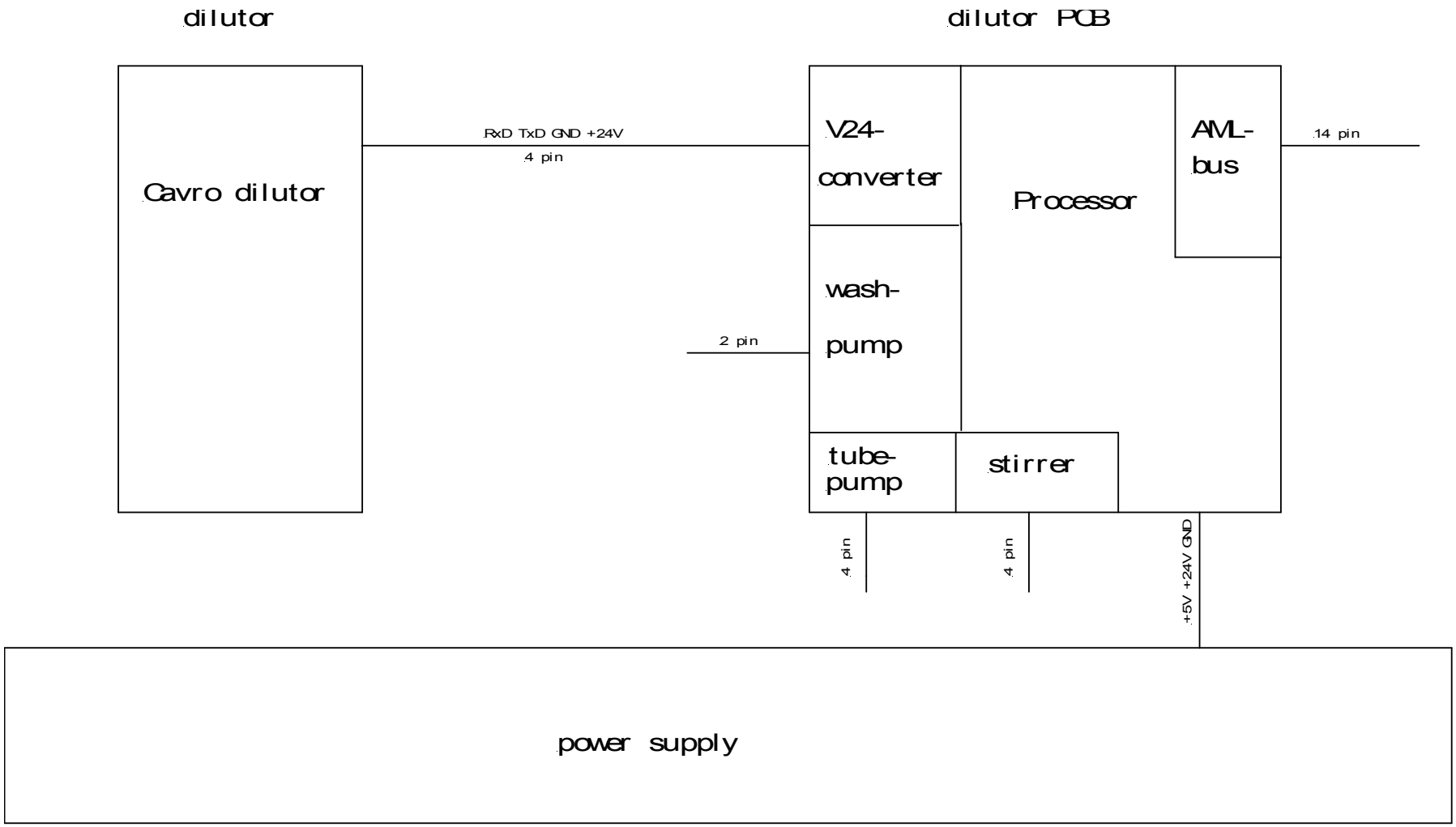
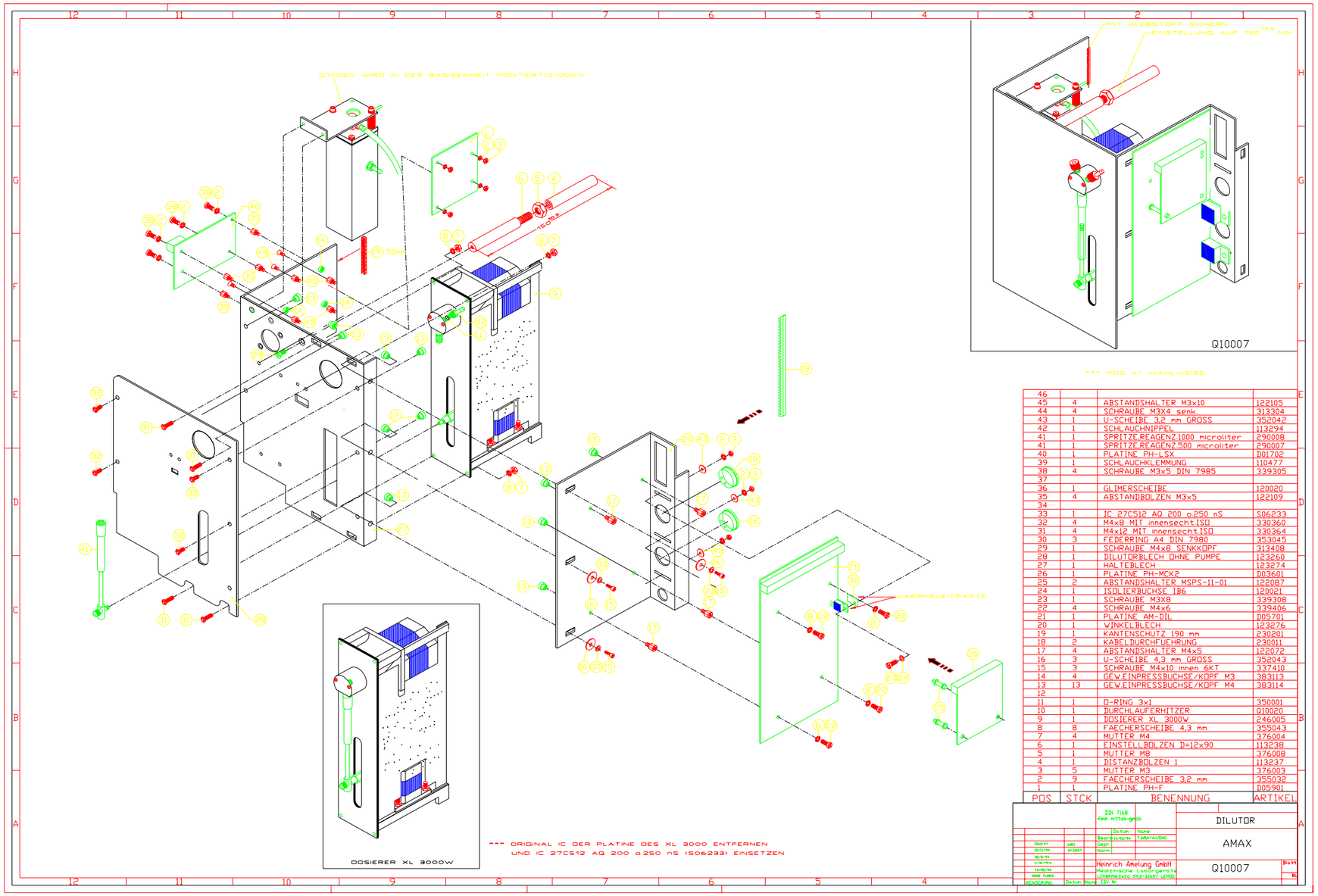
PC-AMAX Circuit Diagram	13 – 36
Wirering for AC/DC-Supply	13 – 37
Moduls PCB Location	13 – 38

Verdrahtungsplan Dilutor
Circuit Diagramme Dilutor

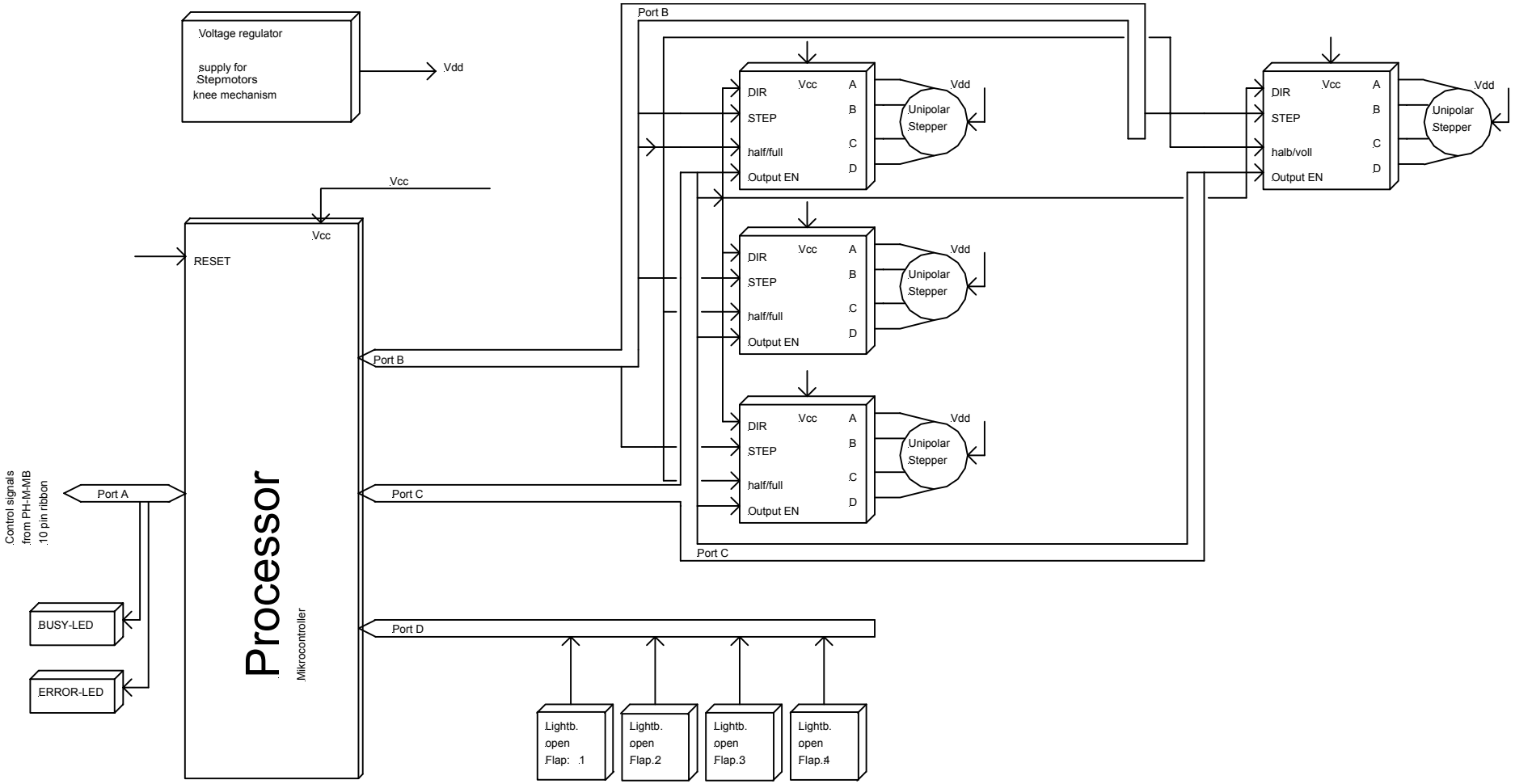


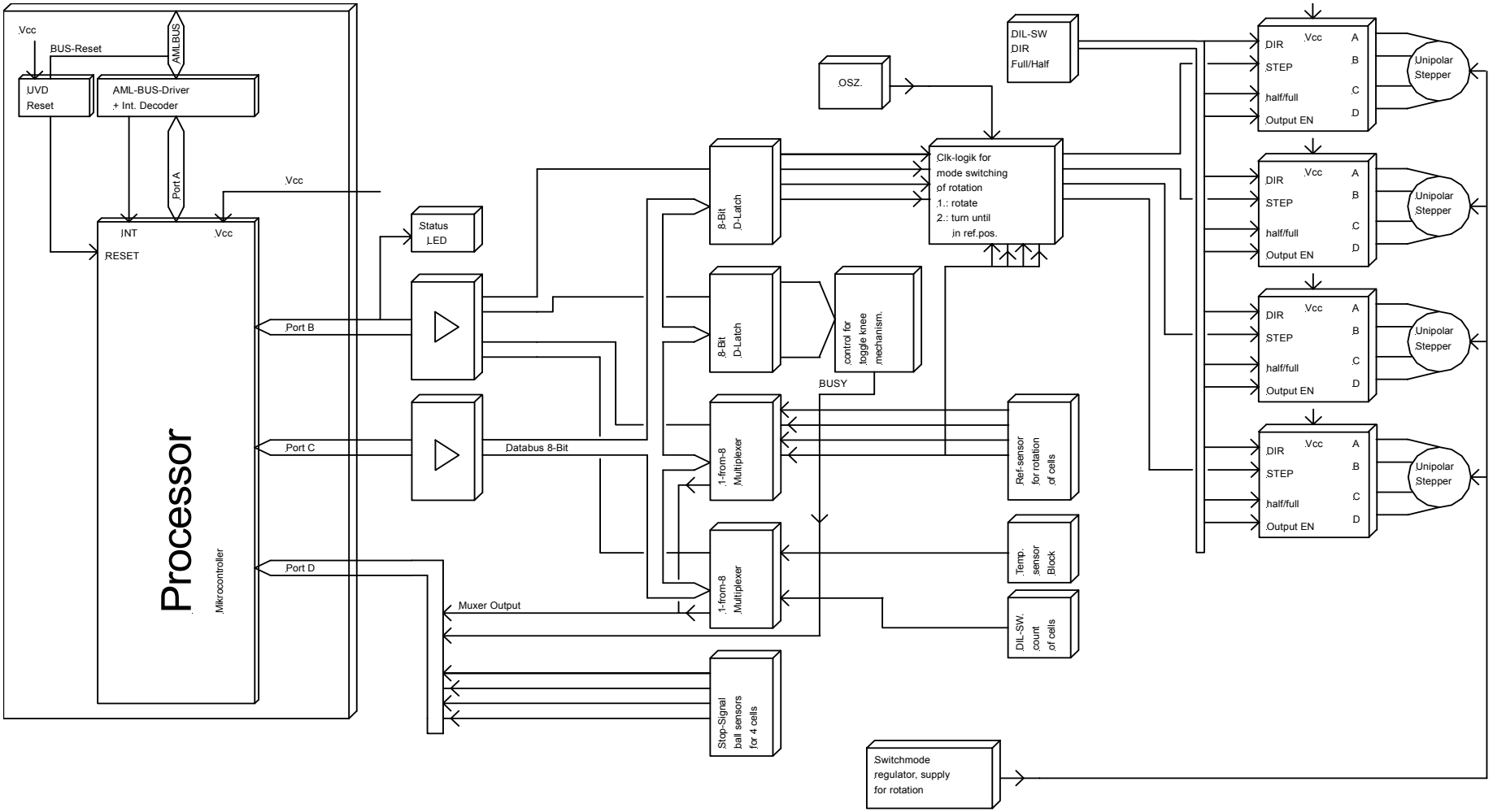

dilutor
dilutor PCB
Cavro dilutor
RxD TxD GND +24V
4 pin
V24-
converter
Processor
AML-
bus
14 pin
wash-
pump
2 pin
tube-
pump
stirrer
4 pin
4 pin
+5V +24V GND
power supply

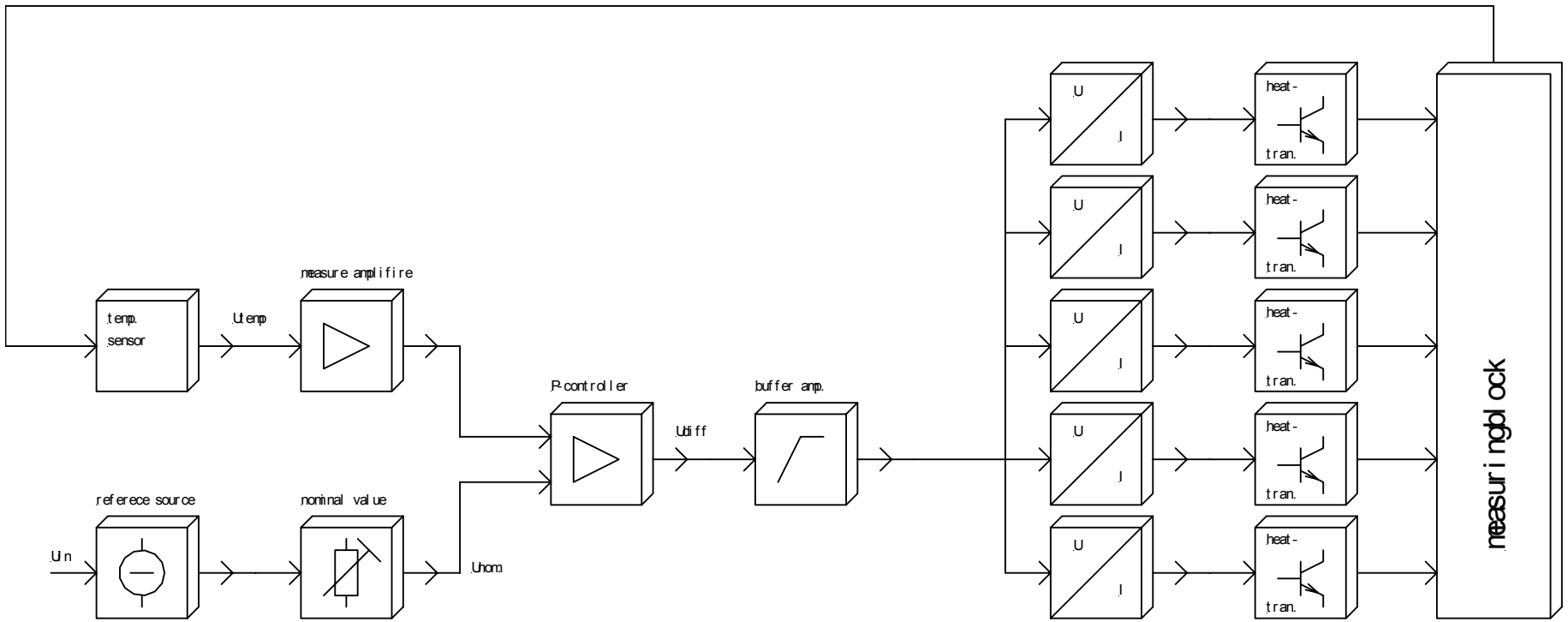


POS	STCK	BENENNUNG	ARTIKEL
46			
45	4	ABSTANDSHALTER M3x10	122105
44	4	SCHRAUBE M3X4 senk.	313304
43	1	U-SCHEIBE 3,2 mm GROSS	352042
42	1	SCHLAUCHNIPPEL	113294
41	1	SPRITZE,REAGENZ.1000 microliter	290008
41	1	SPRITZE,REAGENZ.500 microliter	290007
40	1	PLATINE PH-LSx	D01702
39	1	SCHLAUCHKLEMMUNG	110477
38	4	SCHRAUBE M3x5 DIN 7985	339305
37			
36	1	GLIMMERSCHEIBE	120020
35	4	ABSTANDBOLZEN M3x5	122109
34			
33	1	IC 27C512 AQ 200 0.250 nS	S06233
32	4	M4x8 MIT innensechtISO	330360
31	4	M4x12 MIT innensechtISO	330364
30	3	FEDERRING A4 DIN 7980	353045
29	1	SCHRAUBE M4x8 SENKKOPF	313408
28	1	DILUTORBLECH OHNE PUMPE	123260
27	1	HALTEBLECH	123274
26	1	PLATINE PH-MCK2	D03601
25	2	ABSTANDSHALTER MSPS-11-01	122087
24	1	ISOLIERBUCHSE IB6	120021
23	1	SCHRAUBE M3X8	339308
22	4	SCHRAUBE M4x6	339406
21	1	PLATINE AM-DIL	D05701
20	1	WINKELBLECH	123276
19	1	KANTENSCHUTZ 190 mm	230201
18	2	KABELDURCHFUEHRUNG	230011
17	4	ABSTANDSHALTER M4x5	122072
16	3	U-SCHEIBE 4,3 mm GROSS	352043
15	3	SCHRAUBE M4x10 innen 6KT	337410
14	4	GEW.EINPRESSBUCHSE/KOPF M3	383113
13	13	GEW.EINPRESSBUCHSE/KOPF M4	383114
12			
11	1	O-RING 3x1	350001
10	1	DURCHLAUFERHITZER	Q10020
9	1	DOSIERER XL 3000W	246005
8	8	FAECHERSCHEIBE 4,3 mm	355043
7	4	MUTTER M4	376004
6	1	EINSTELLBOLZEN D=12x90	113238
5	1	MUTTER M8	376008
4	1	DISTANZBOLZEN 1	113237
3	5	MUTTER M3	376003
2	9	FAECHERSCHEIBE 3,2 mm	355032
1	1	PLATINE PH-F	D05901

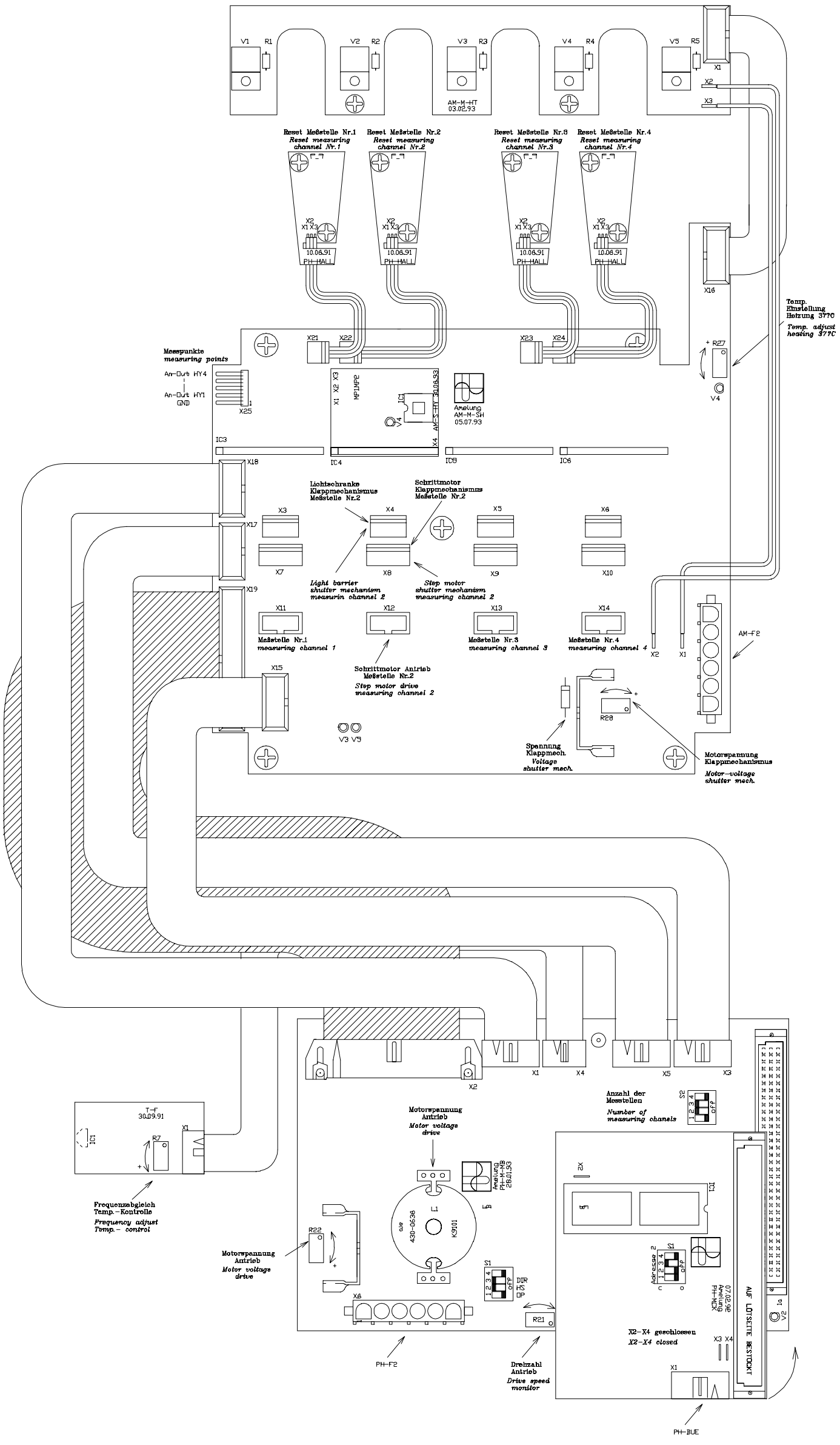
DIN 7168 fein mittel grob
Datum Name
Bearb. 11.02.94 TARAVAING
Gepr.
Norm.
Heinrich Amelung GmbH
Medizinische Laborgeräte
Lohnerfeld 993-32607 LEMGO
DILUTOR
AMAX
Q10007
Blatt
Bl.

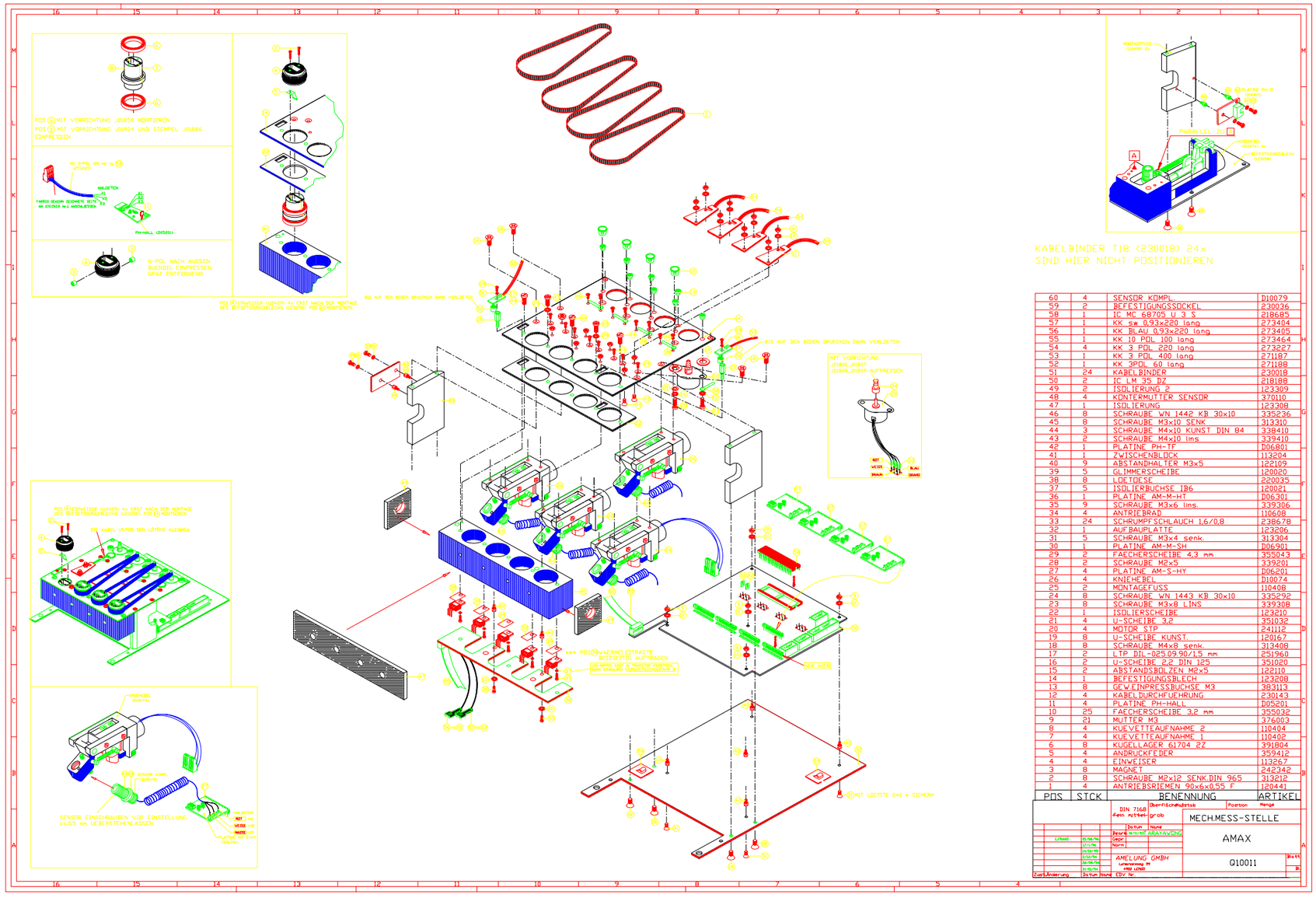

Voltage regulator
supply for
Stepmotors
knee mechanism
Vdd
Vcc
RESET
Processor
Mikrocontroller
Port A
Port B
Port C
Port D
Control signals
from PH-M-MB
10 pin ribbon
BUSY-LED
ERROR-LED
DIR
STEP
half/full
Output EN
halb/voll
A
B
C
D
Unipolar
Stepper
Lightb.
open
Flap: 1
Flap.2
Flap.3
Flap.4


Vcc
BUS-Reset
AMLBUS
UVD
Reset
AML-BUS-Driver
+ Int. Decoder
Port A
Vcc
INT
Vcc
RESET
Processor
Mikrocontroller
Port B
Port C
Port D
Status
LED
Databus 8-Bit
Muxer Output
8-Bit
D-Latch
8-Bit
D-Latch
1-from-8
Multiplexer
1-from-8
Multiplexer
Stop-Signal
ball sensors
for 4 cells
OSZ.
Clk-logik for
mode switching
of rotation
1.: rotate
2.: turn until
in ref.pos.
control for
toggle knee
mechanism.
BUSY
DIL-SW
DIR
Full/Half
Ref-sensor
for rotation
of cells
Temp.
sensor
Block
DIL-SW.
count
of cells
Switchmode
regulator, supply
for rotation
DIR
STEP
half/full
Output EN
Vcc
A
B
C
D
Unipolar
Stepper


temp. sensor
Utemp
measure amplifire
P-controller
Utdiff
buffer amp.
referece source
Un
nominal value
Uhom
U
I
heat-tran.
measuring block

Verdrahtungsplan mechanische Meßstelle Amax
Mechanical Measuring Station Circuit Diagramme





POS	STCK	BENENNUNG	ARTIKEL
60	4	SENSOR KOMPL.	D10079
59	2	BEFESTIGUNGSSOCKEL	230036
58	1	IC MC 68705 U 3 S	218685
57	1	KK sw 0,93x220 lang	273404
56	1	KK BLAU 0,93x220 lang	273405
55	1	KK 10 POL 100 lang	273464
54	4	KK 3 POL 220 lang	273227
53	1	KK 3 POL 400 lang	271187
52	1	KK 3POL 60 lang	271188
51	24	KABELBINDER	230018
50	2	IC LM 35 DZ	218188
49	2	ISOLIERUNG 2	123309
48	4	KONTERMUTTER SENSOR	370110
47	1	ISOLIERUNG	123308
46	8	SCHRAUBE WN 1442 KB 30x10	335236
45	8	SCHRAUBE M3x10 SENK	313310
44	3	SCHRAUBE M4x10 KUNST DIN 84	338410
43	2	SCHRAUBE M4x10 lins	339410
42	1	PLATINE PH-TF	D06801
41	1	ZWISCHENBLOCK	113204
40	9	ABSTANDHALTER M3x5	122109
39	5	GLIMMERSCHEIBE	120020
38	8	LOETOESE	220035
37	5	ISOLIERBUCHSE IB6	120021
36	1	PLATINE AM-M-HT	D06201
35	9	SCHRAUBE M3x6 lins.	339306
34	4	ANTRIEBRAD	110608
33	24	SCHRUMPFSCHLAUCH 1,6/0,8	238678
32	1	AUFBAUPLATTE	123206
31	5	SCHRAUBE M3x4 senk.	313304
30	1	PLATINE AM-M-SH	D06901
29	2	FAECHERSCHEIBE 4,3 mm	355043
28	2	SCHRAUBE M2x5	339201
27	4	PLATINE AM-S-HY	D06201
26	4	KNIEHEBEL	D10074
25	2	MONTAGEFUSS	110408
24	8	SCHRAUBE WN 1443 KB 30x10	335292
23	8	SCHRAUBE M3x8 LINS.	339308
22	1	ISOLIERSCHEIBE	123210
21	4	U-SCHEIBE 3,2	351032
20	4	MOTOR STP	241112
19	8	U-SCHEIBE KUNST.	120167
18	8	SCHRAUBE M4x8 senk.	313408
17	2	LTP DIL-025.09.90/1.5 mm	251960
16	2	U-SCHEIBE 2,2 DIN 125	351020
15	2	ABSTANDSBOLZEN M2x5	122110
14	1	BEFESTIGUNGSBLECH	123208
13	8	GEW.EINPRESSBUCHSE M3	383113
12	4	KABELDURCHFUEHRUNG	230143
11	4	PLATINE PH-HALL	D05201
10	25	FAECHERSCHEIBE 3,2 mm	355032
9	21	MUTTER M3	376003
8	4	KUEVETTEAUFNAHME 2	110404
7	4	KUEVETTEAUFNAHME 1	110402
6	8	KUGELLAGER 61704 2Z	391804
5	4	ANDRUCKFEDER	359412
4	4	EINWEISER	113267
3	8	MAGNET	242342
2	8	SCHRAUBE M2x12 SENK.DIN 965	313212
1	4	ANTRIEBSRIEMEN 90x6x0,55 F	120441

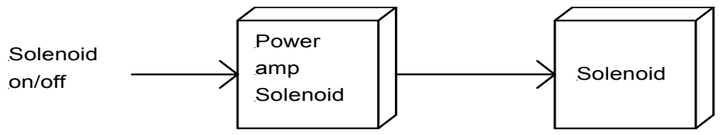
DIN 7168 fein mittel grob — Oberflächenstufe — Position — Menge

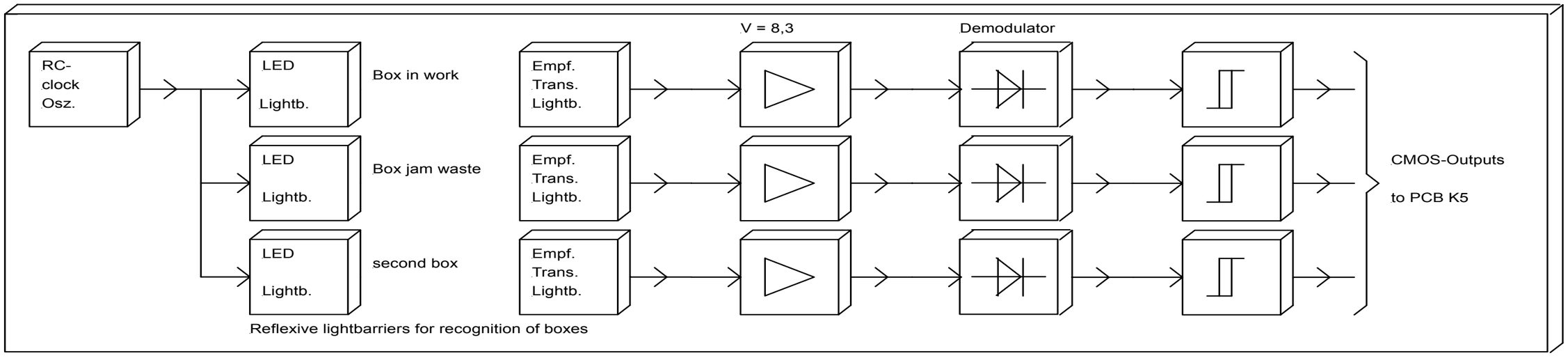
MECH.MESS-STELLE

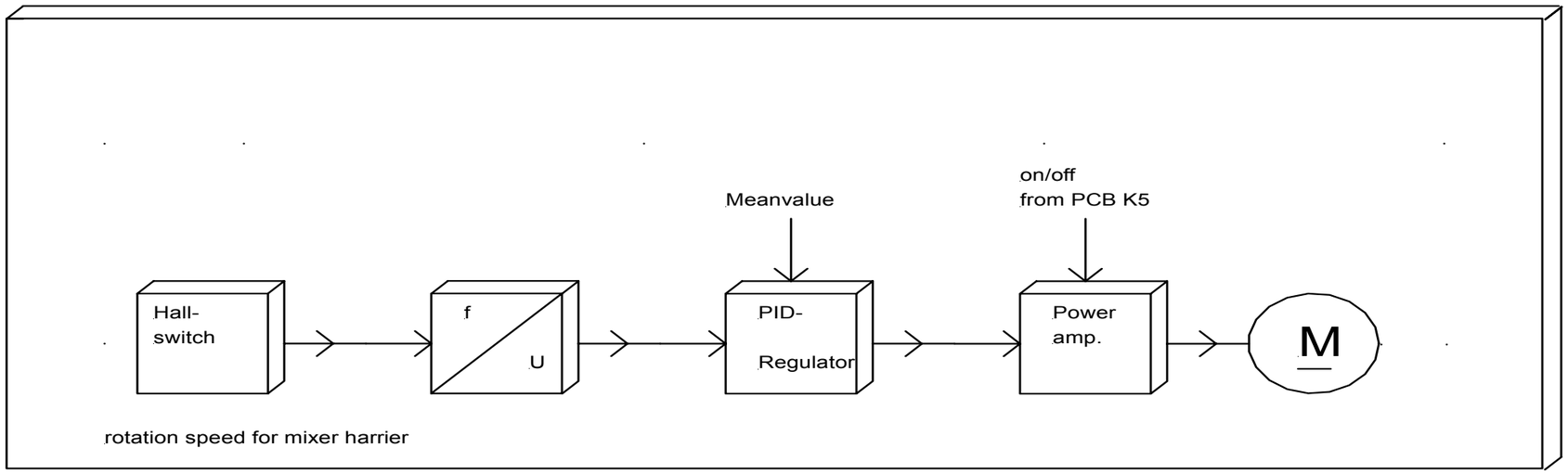
AMAX

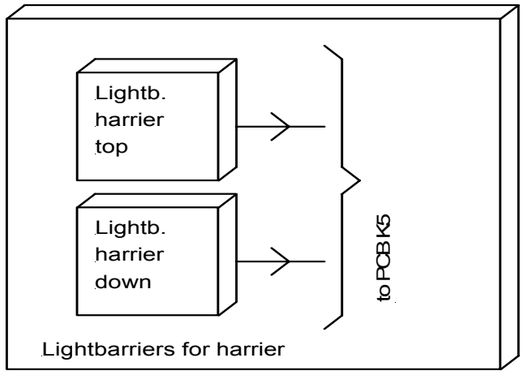
AMELUNG GMBH

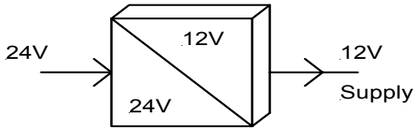
Q10011



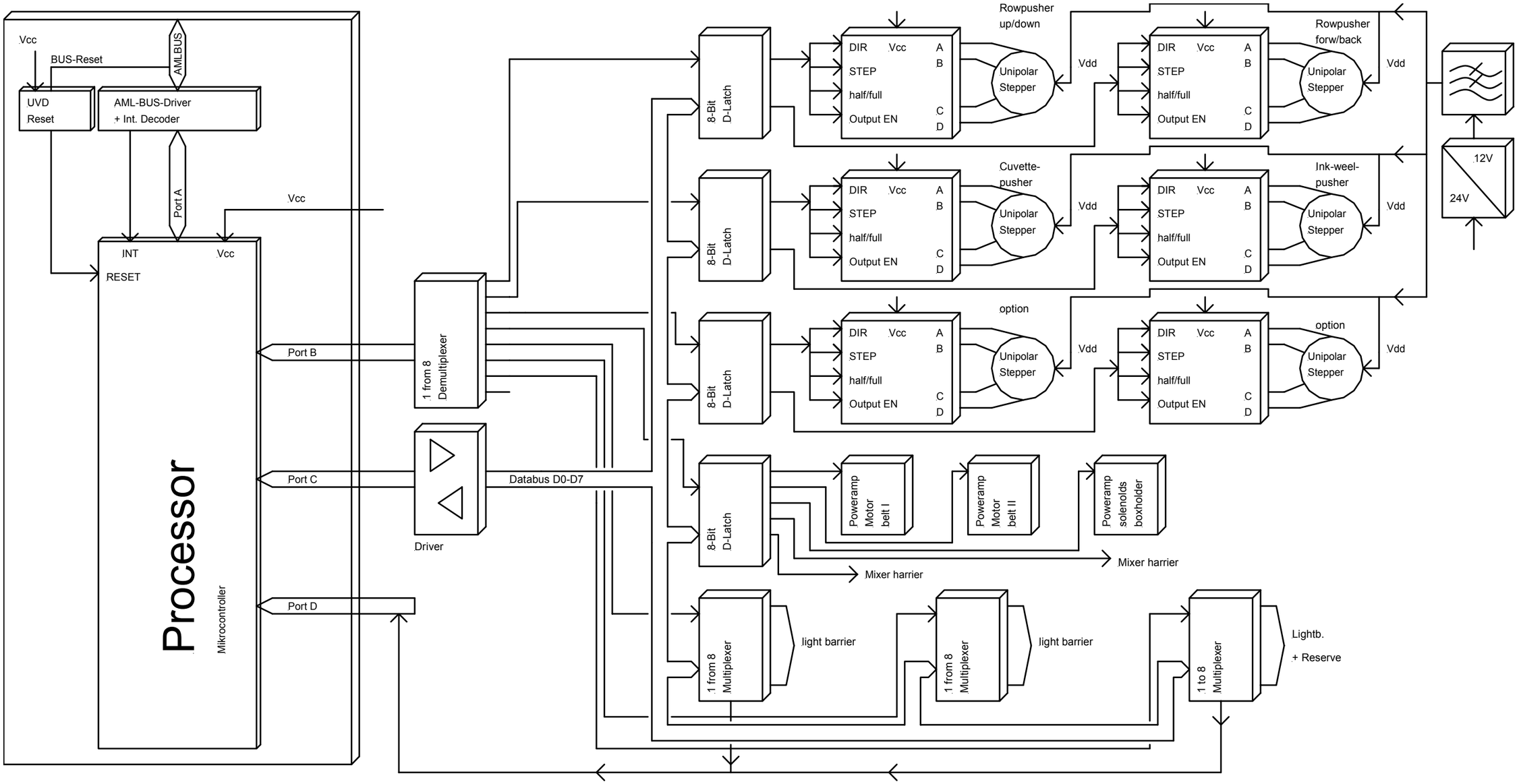




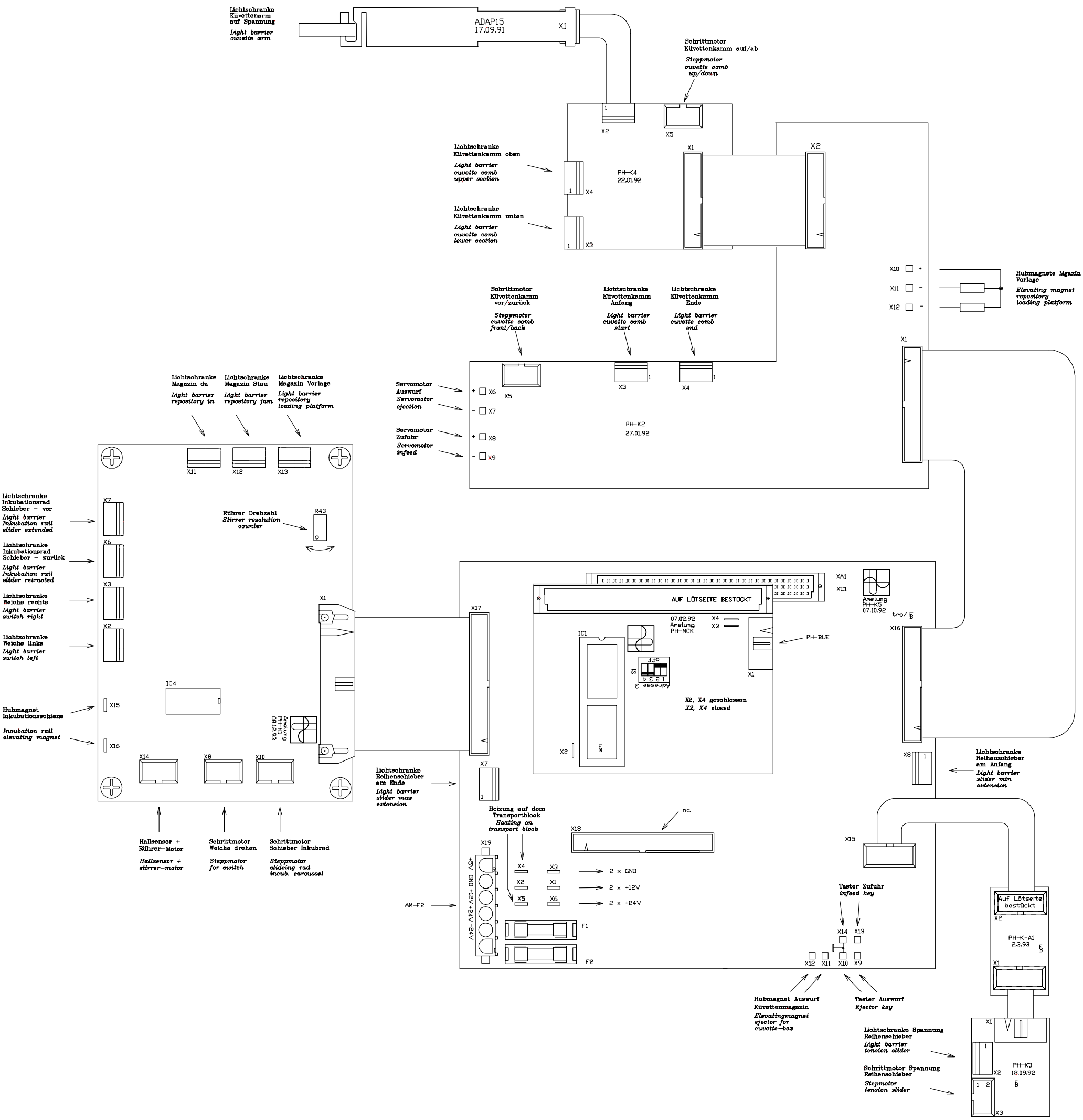


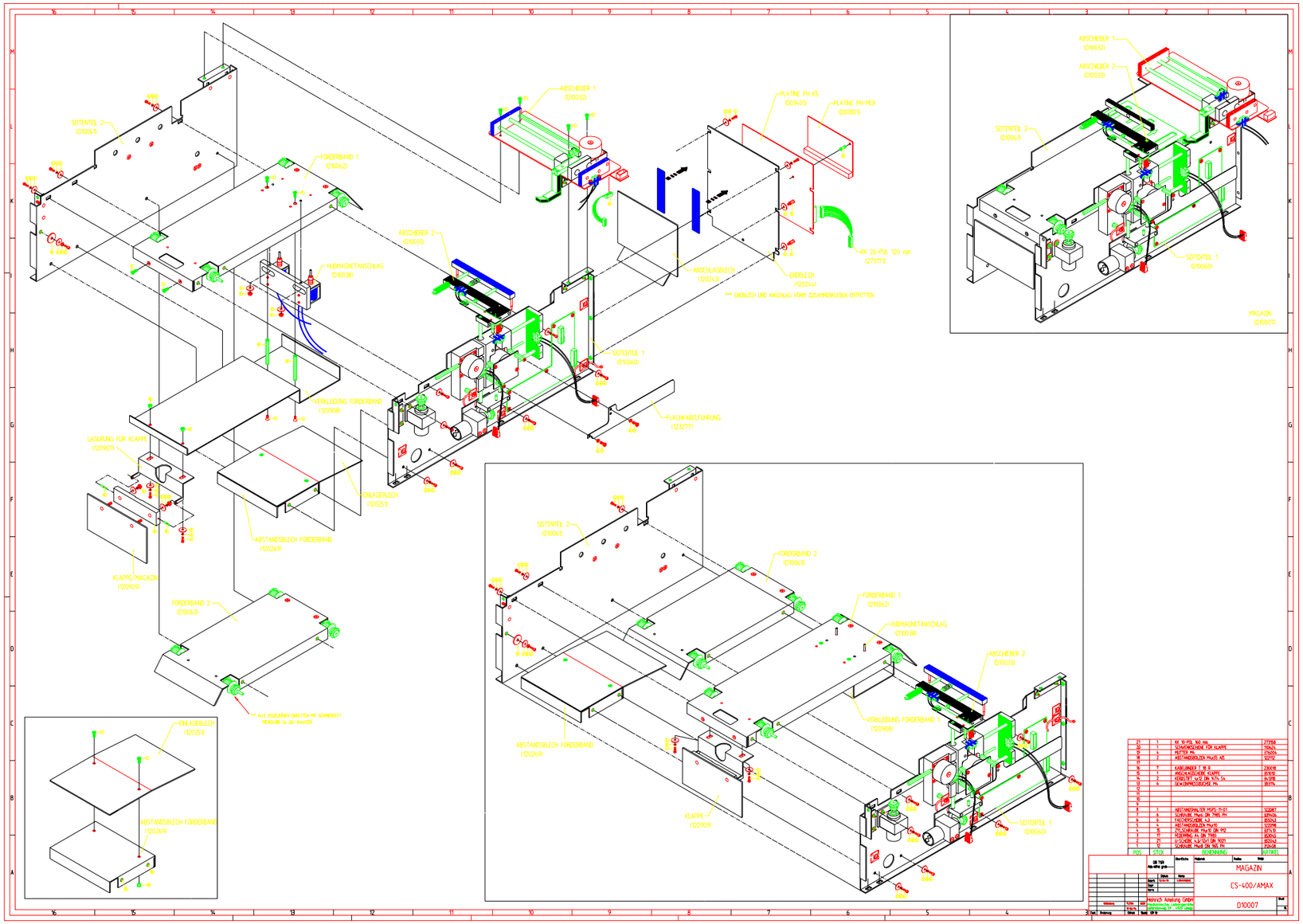


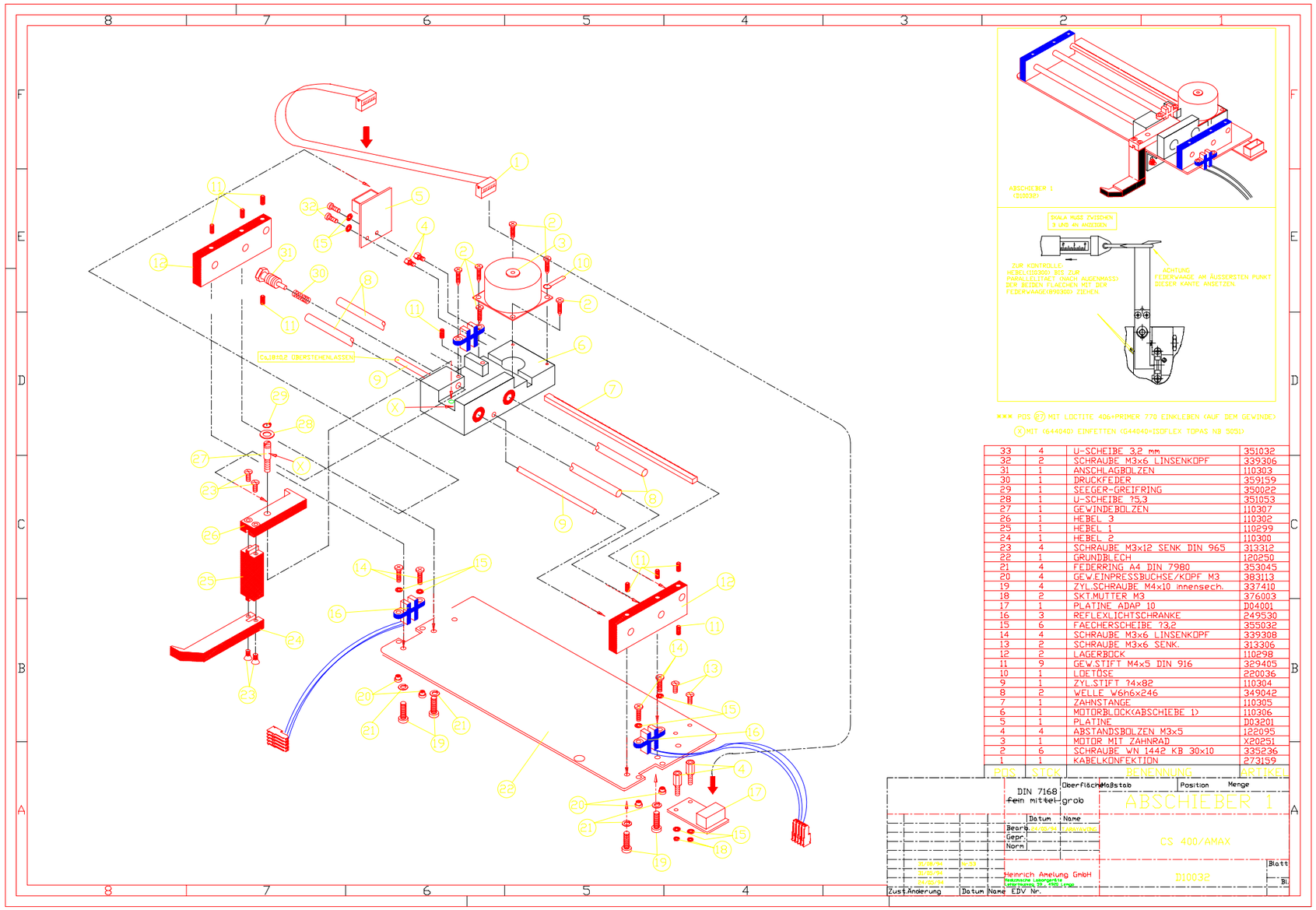
PH-K1 on harrier


Vcc
BUS-Reset
AMLBUS
UVD
Reset
AML-BUS-Driver
+ Int. Decoder
Port A
Vcc
INT
Vcc
RESET
Port B
Port C
Port D
Processor
Mikrocontroller
1 from 8
Demultiplexer
Driver
Databus D0-D7
8-Bit
D-Latch
DIR
Vcc
A
B
STEP
half/full
Output EN
C
D
Unipolar
Stepper
Rowpusher
up/down
Rowpusher
forw/back
Cuvette-
pusher
Ink-weel-
pusher
option
option
Vdd
12V
24V
Poweramp
Motor
belt I
Poweramp
Motor
belt II
Poweramp
solenolds
boxholder
Mixer harrier
Mixer harrier
1 from 8
Multiplexer
light barrier
1 from 8
Multiplexer
light barrier
1 to 8
Multiplexer
Lightb.
+ Reserve

Verdrahtungsplan Küvettenmagazin
Cuvette Repository Circuit Diagramme




ABSCHIEBER 1
(D10032)
ABSCHIEBER 2
(D10033)
SEITENTEIL 2
(D10061)
SEITENTEIL 1
(D10060)
MAGAZIN
(D10007)
FÖRDERBAND 1
(D10062)
FÖRDERBAND 2
(D10063)
HUBMAGNETANSCHLAG
(D10038)
PLATINE PH-KS
(D03401)
PLATINE PH-MCX
(D08801)
HOL 26-POL 120 mm
(273170)
ANSCHLAGBLECH
(120263)
ENDBLECH
(120244)
*** ENDBLECH UND ANSCHLAG VORM ZUSAMMENKLEBEN ENTFETTEN
VERKLEIDUNG FÖRDERBAND
(120908)
FLACHKABELFÜHRUNG
(123277)
LAGERUNG FÜR KLAPPE
(120907)
EINLAGEBLECH
(120253)
ABSTANDSBLECH FÖRDERBAND
(120269)
KLAPPE/MAGAZIN
(120909)
ALLE ANSCHLAGFLÄCHEN MIT SCHMIERFETT
MOLYKOTE EL 261 WAHRSO
KLAPPE
(120909)
POS
STEX
BENENNUNG
MATERIAL
MAGAZIN
CS-400/AMAX
Heinrich Amelung GmbH
D10007



POS	STCK	BENENNUNG	ARTIKEL
33	4	U-SCHEIBE 3,2 mm	351032
32	2	SCHRAUBE M3x6 LINSENKOPF	339306
31	1	ANSCHLAGBOLZEN	110303
30	1	DRUCKFEDER	359159
29	1	SEEGER-GREIFRING	350022
28	1	U-SCHEIBE ?5,3	351053
27	1	GEWINDEBOLZEN	110307
26	1	HEBEL 3	110302
25	1	HEBEL 1	110299
24	1	HEBEL 2	110300
23	4	SCHRAUBE M3x12 SENK DIN 965	313312
22	1	GRUNDBLECH	120250
21	4	FEDERRING A4 DIN 7980	353045
20	4	GEW.EINPRESSBUCHSE/KOPF M3	383113
19	4	ZYL.SCHRAUBE M4x10 innensech.	337410
18	2	SKT.MUTTER M3	376003
17	1	PLATINE ADAP 10	D04001
16	3	REFLEXLICHTSCHRANKE	249530
15	6	FAECHERSCHEIBE ?3,2	355032
14	4	SCHRAUBE M3x6 LINSENKOPF	339308
13	2	SCHRAUBE M3x6 SENK.	313306
12	2	LAGERBOCK	110298
11	9	GEW.STIFT M4x5 DIN 916	329405
10	1	LOETOSE	220036
9	1	ZYL.STIFT ?4x82	110304
8	2	WELLE W6h6x246	349042
7	1	ZAHNSTANGE	110305
6	1	MOTORBLOCK<ABSCHIEBE 1>	110306
5	1	PLATINE	D03201
4	4	ABSTANDSBOLZEN M3x5	122095
3	1	MOTOR MIT ZAHNRAD	X20251
2	6	SCHRAUBE WN 1442 KB 30x10	335236
1	1	KABELKONFEKTION	273159

DIN 7168 fein mittel | Oberfläche grob | Maßstab | Position | Menge

ABSCHIEBER 1

Datum | Name
Bearb. 01.10.97 Lindenthal
Gepr.
Norm

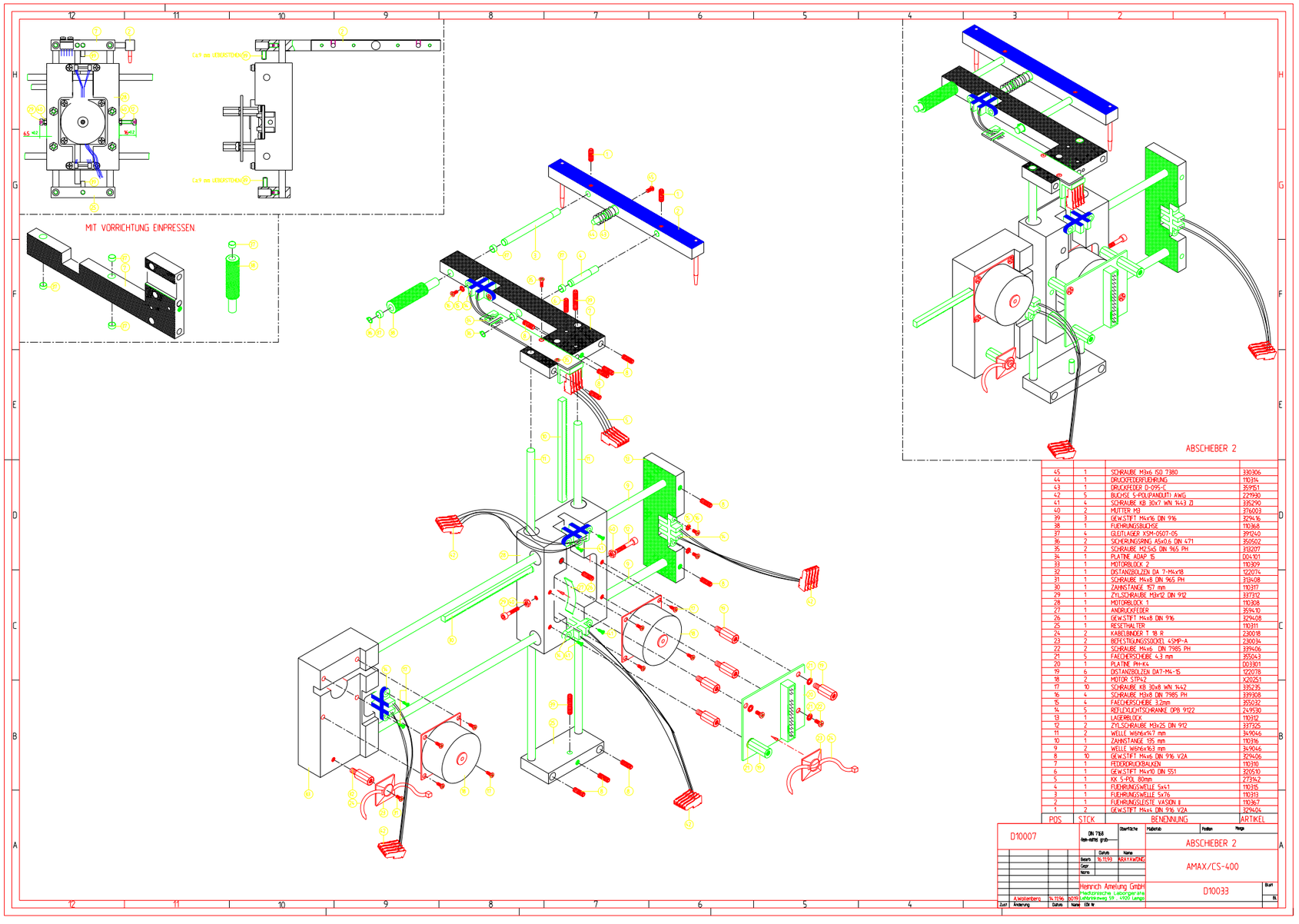
CS 400/AMAX

Heinrich Amelung GmbH
Medizinische Laborgeräte
Lemgo/Lippe, Postfach 1580

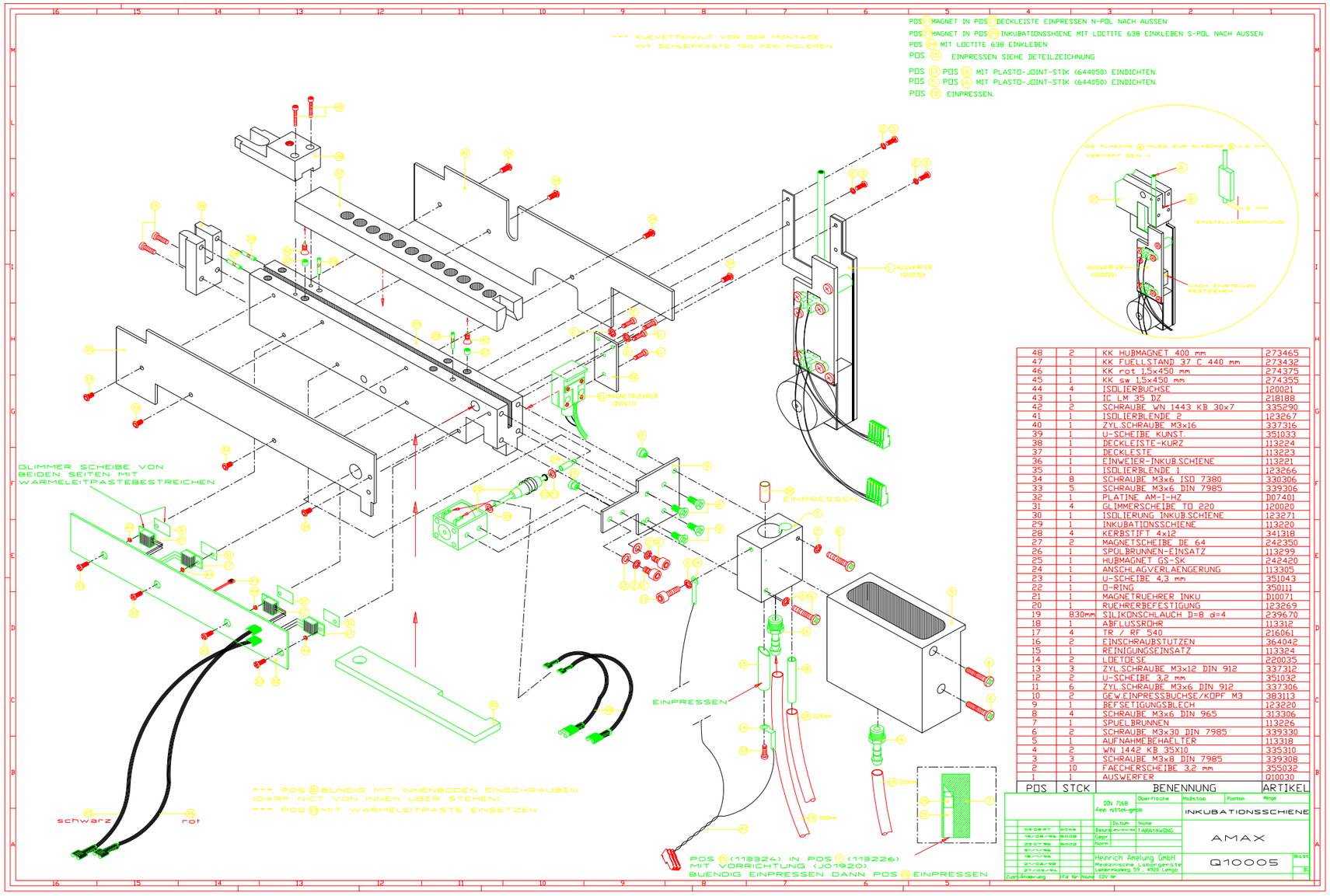
D10032

Blatt

Zust. Änderung | Datum | Name | EDV Nr.

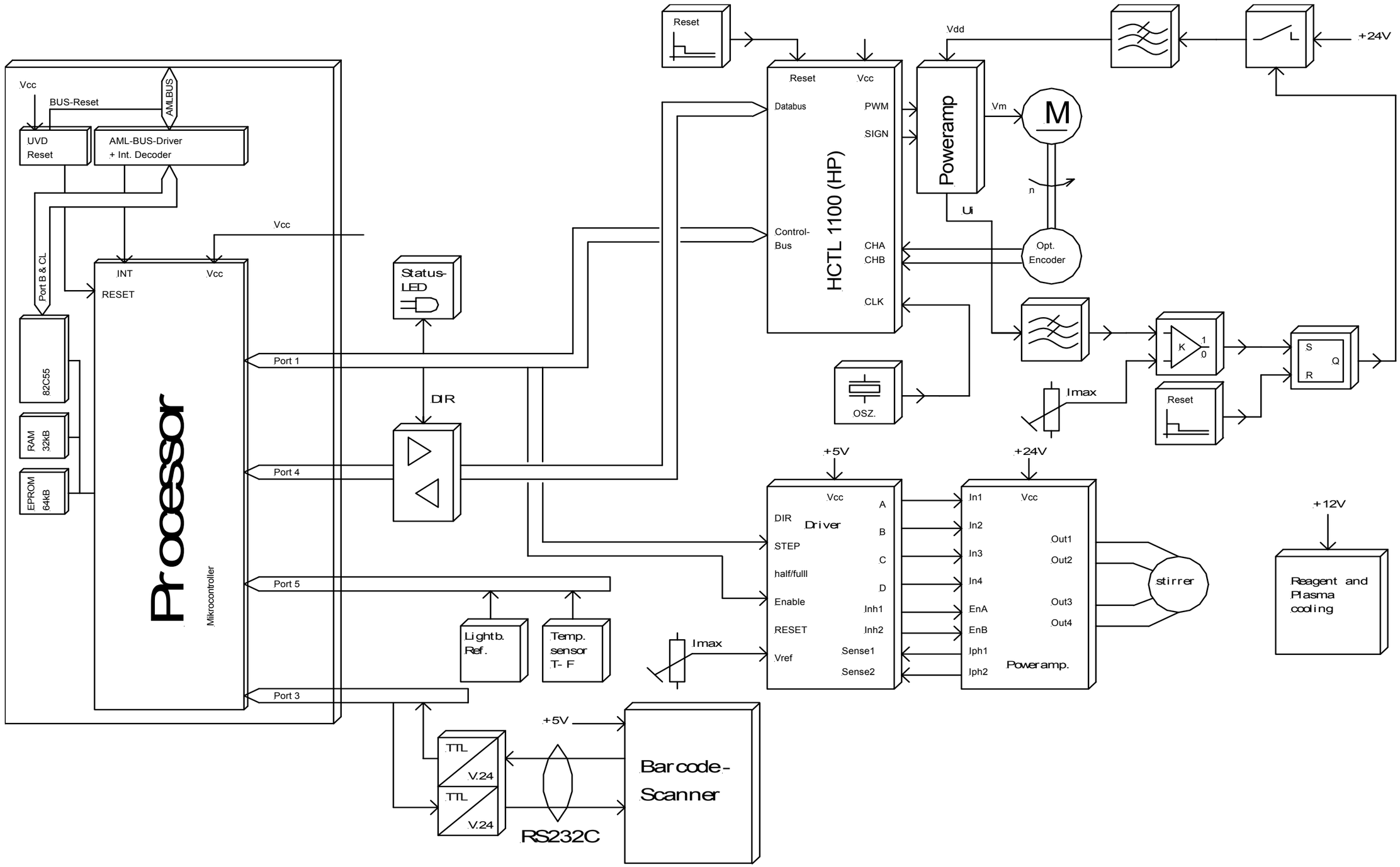


POS	STCK	BENENNUNG	ARTIKEL
45	1	SCHRAUBE M3x6 ISO 7380	330306
44	1	DRUCKFEDERFUEHRUNG	110314
43	1	DRUCKFEDER D-095-C	359151
42	5	BUCHSE S-POLYAMID/TI AWG	227930
41	4	SCHRAUBE KB 30x7 WN 1443 ZI	335290
40	2	MUTTER M3	376003
39	3	GEWSTIFT M4x16 DIN 916	329416
38	1	FUEHRUNGSBUCHSE	110368
37	4	GLEITLAGER XSM-0507-05	391240
36	2	SICHERUNGSRING A5x0.6 DIN 471	350502
35	2	SCHRAUBE M2.5x5 DIN 965 PH	313207
34	1	PLATINE ADAP 15	D04101
33	1	MOTORBLOCK 2	110309
32	1	DISTANZBOLZEN DA 7-M4x18	322074
31	1	SCHRAUBE M4x8 DIN 965 PH	313408
30	1	ZAHNSTANGE 157 mm	110317
29	1	ZYLSCHRAUBE M3x12 DIN 912	337312
28	1	MOTORBLOCK 1	110308
27	1	ANDRUCKFEDER	359410
26	1	GEWSTIFT M4x8 DIN 916	329408
25	1	RESETHALTER	110311
24	2	KABELBINDER T 18 R	230018
23	2	BEFESTIGUNGSSOCKEL 45MP-A	230034
22	2	SCHRAUBE M4x6 DIN 7985 PH	339406
21	5	FACHERSCHEIBE 4.3 mm	350043
20	1	PLATINE PH-K4	D03301
19	6	DISTANZBOLZEN DA7-M4-15	322078
18	2	MOTOR STPL2	X20251
17	10	SCHRAUBE KB 30x8 WN 1442	335235
16	4	SCHRAUBE M3x8 DIN 7985 PH	339308
15	4	FACHERSCHEIBE 3.2mm	350032
14	5	REFLEXLICHTSCHRANKE DPB 9122	249530
13	1	LAGERBLOCK	110312
12	2	ZYLSCHRAUBE M3x25 DIN 912	337325
11	2	WELLE W06x157 mm	349046
10	1	ZAHNSTANGE 135 mm	110316
9	2	WELLE W6x6x163 mm	349046
8	10	GEWSTIFT M4x6 DIN 916 V2A	329406
7	1	FEDERKLICKBRAKEN	110310
6	1	GEWSTIFT M4x10 DIN 551	320510
5	1	KK S-POL 80mm	273342
4	1	FUEHRUNGSWELLE 5x41	110315
3	1	FUEHRUNGSWELLE 5x76	110313
2	1	FUEHRUNGSLEISTE VARIAN II	110367
1	2	GEWSTIFT M4x6 DIN 916 V2A	329404



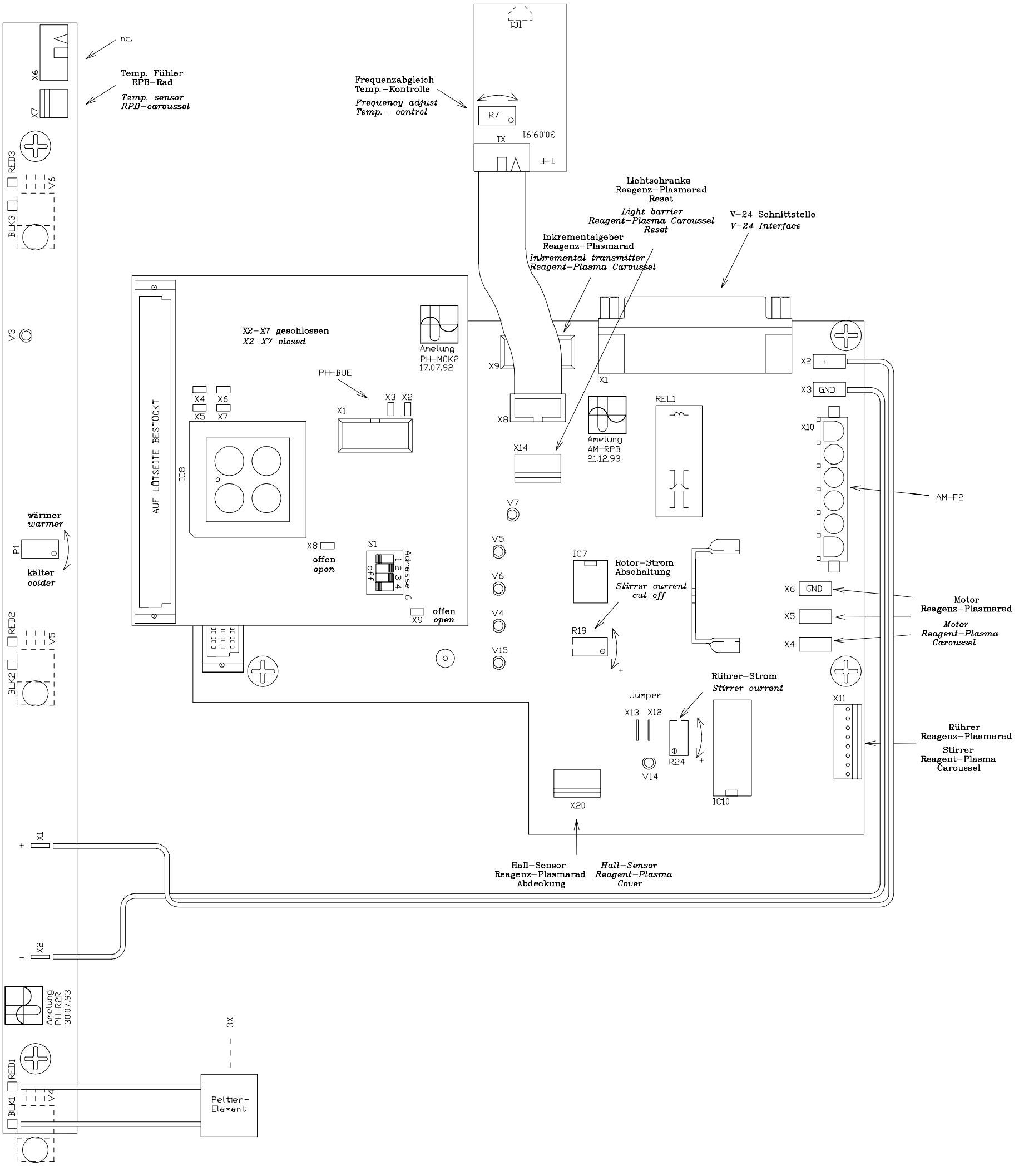
POS	STCK	BENENNUNG	ARTIKEL
48	2	KK HUBMAGNET 400 mm	273465
47	1	KK FUELLSTAND 37 C 440 mm	273432
46	1	KK rot 1.5x450 mm	274375
45	1	KK sw 1.5x450 mm	274355
44	4	ISOLIERBUCHSE	120021
43	1	IC LM 35 DZ	218188
42	2	SCHRAUBE WN 1443 KB 30x7	335290
41	1	ISOLIERBLENDE 2	123267
40	1	ZYL.SCHRAUBE M3x16	337316
39	1	U-SCHEIBE KUNST.	351033
38	1	DECKLEISTE-KURZ	113224
37	1	DECKLEISTE	113223
36	1	EINWEIER-INKUB.SCHIENE	113221
35	1	ISOLIERBLENDE 1	123266
34	8	SCHRAUBE M3x6 ISO 7380	330306
33	5	SCHRAUBE M3x6 DIN 7985	339305
32	1	PLATINE AM-I-HZ	D07401
31	4	GLIMMERSCHEIBE TO 220	120020
30	1	ISOLIERUNG INKUB.SCHIENE	123271
29	1	INKUBATIONSSCHIENE	113220
28	4	KERBSTIFT 4x12	341318
27	2	MAGNETSCHEIBE DE 64	242350
26	1	SPUL.BRUNNEN-EINSATZ	113299
25	1	HUBMAGNET GS-SK	242420
24	1	ANSCHLAGVERLAENGERUNG	113305
23	1	U-SCHEIBE 4,3 mm	351043
22	1	O-RING	350111
21	1	MAGNETRUEHRER INKU	D10071
20	1	RUEHRERBEFESTIGUNG	123269
19	830mm	SILIKONSCHLAUCH D=8 d=4	239670
18	1	ABFLUSSROHR	113312
17	4	TR / RF 540	216061
16	2	EINSCHRAUBSTUTZEN	364042
15	1	REINIGUNGSEINSATZ	113324
14	2	LOETOESE	220035
13	3	ZYL.SCHRAUBE M3x12 DIN 912	337312
12	2	U-SCHEIBE 3,2 mm	351032
11	6	ZYL.SCHRAUBE M3x6 DIN 912	337306
10	2	GEW.EINPRESSBUCHSE/KOPF M3	383113
9	1	BEFSETIGUNGSBLECH	123220
8	4	SCHRAUBE M3x6 DIN 965	313306
7	1	SPUELBRUNNEN	113226
6	2	SCHRAUBE M3x30 DIN 7985	339330
5	1	AUFNAHMEBEHAELTER	113318
4	2	WN 1442 KB 35X10	335310
3	3	SCHRAUBE M3x8 DIN 7985	339308
2	10	FAECHERSCHEIBE 3,2 mm	355032
1	1	AUSWERFER	Q10030

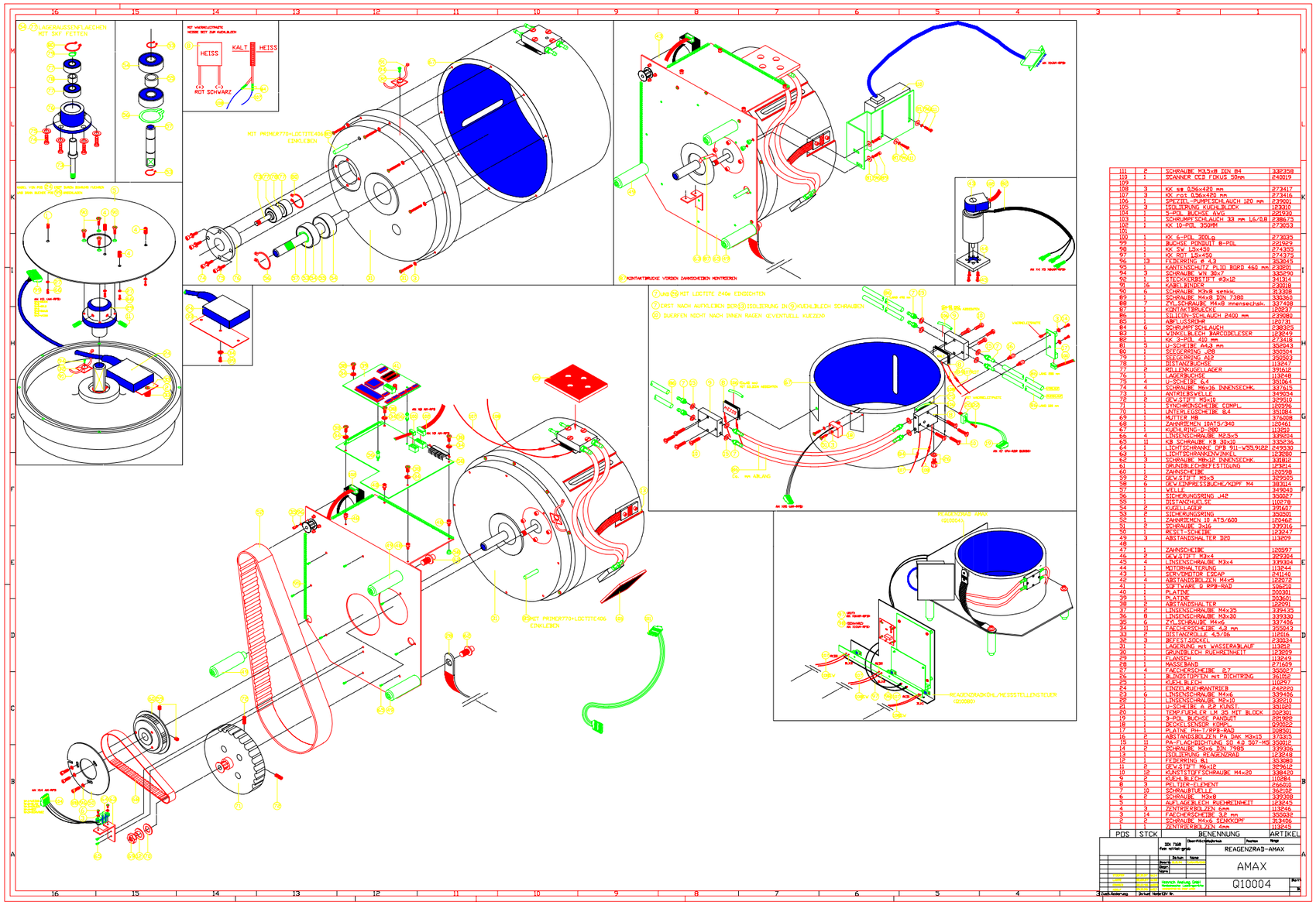
DIN 7168 fein mittel-grob
Oberfläche | Maßstab | Position | Menge
INKUBATIONSSCHIENE
Datum | Name
08.08.97 | 0004 | Bearb. | TARAYAWONG
19.06.96 | 8008 | Gepr.
23.07.96 | 8002 | Norm.
21.05.98 | Heinrich Amelung GmbH Medizinische Laborgeräte Lemgo
AMAX
Q10005
Zust.Änderung | Tag | Name | Ers. für | Ers. durch


Reset
Vdd
+24V
L
Vcc
BUS-Reset
AMLBUS
UVD
Reset
AML-BUS-Driver
+ Int. Decoder
Reset
Vcc
Databus
PWM
SIGN
HCTL 1100 (HP)
Control-
Bus
CHA
CHB
CLK
Poweramp
Vm
M
n
Ui
Opt.
Encoder
Vcc
Port B & CL
INT
RESET
Vcc
Status-
LED
Port 1
DIR
82C55
RAM
32kB
EPROM
64kB
Port 4
Port 5
Port 3
Mikrocontroller
OSZ.
Imax
K
1
0
S
Q
R
Reset
+5V
+24V
Vcc
DIR
Driver
STEP
half/fulll
Enable
RESET
Vref
A
B
C
D
Inh1
Inh2
Sense1
Sense2
In1
In2
In3
In4
EnA
EnB
Iph1
Iph2
Vcc
Out1
Out2
Out3
Out4
Poweramp.
stirrer
+12V
Reagent and
Plasma
cooling
Lightb.
Ref.
Temp.
sensor
T- F
Imax
+5V
TTL
V.24
TTL
V.24
RS232C
Barcode-
Scanner

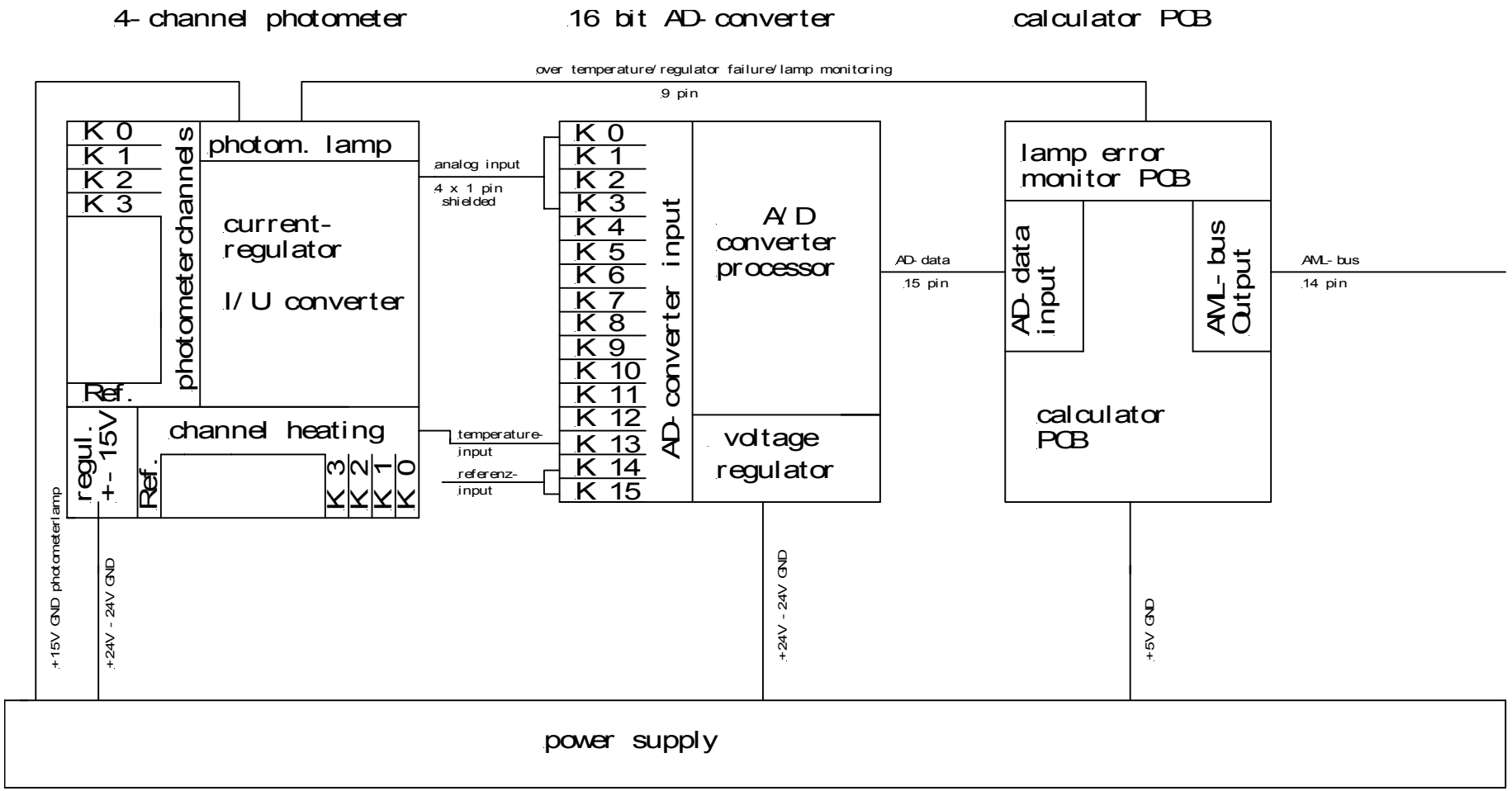
Verdrahtungsplan
Reagenz–Plasmarad–Barcodeleser

Circuit Diagragramme
Reagent–Plasma–Caroussel Barcode–Reader

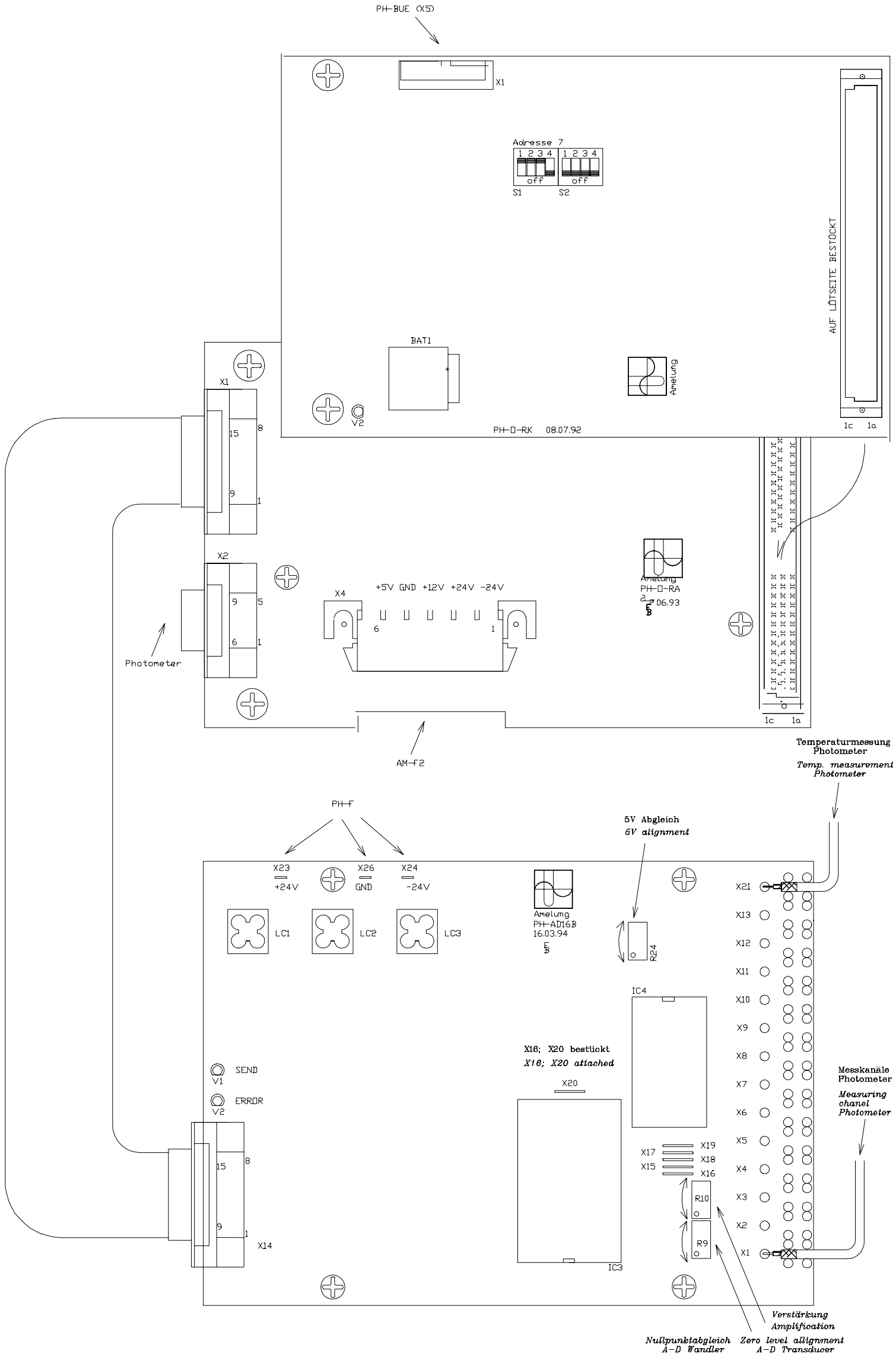


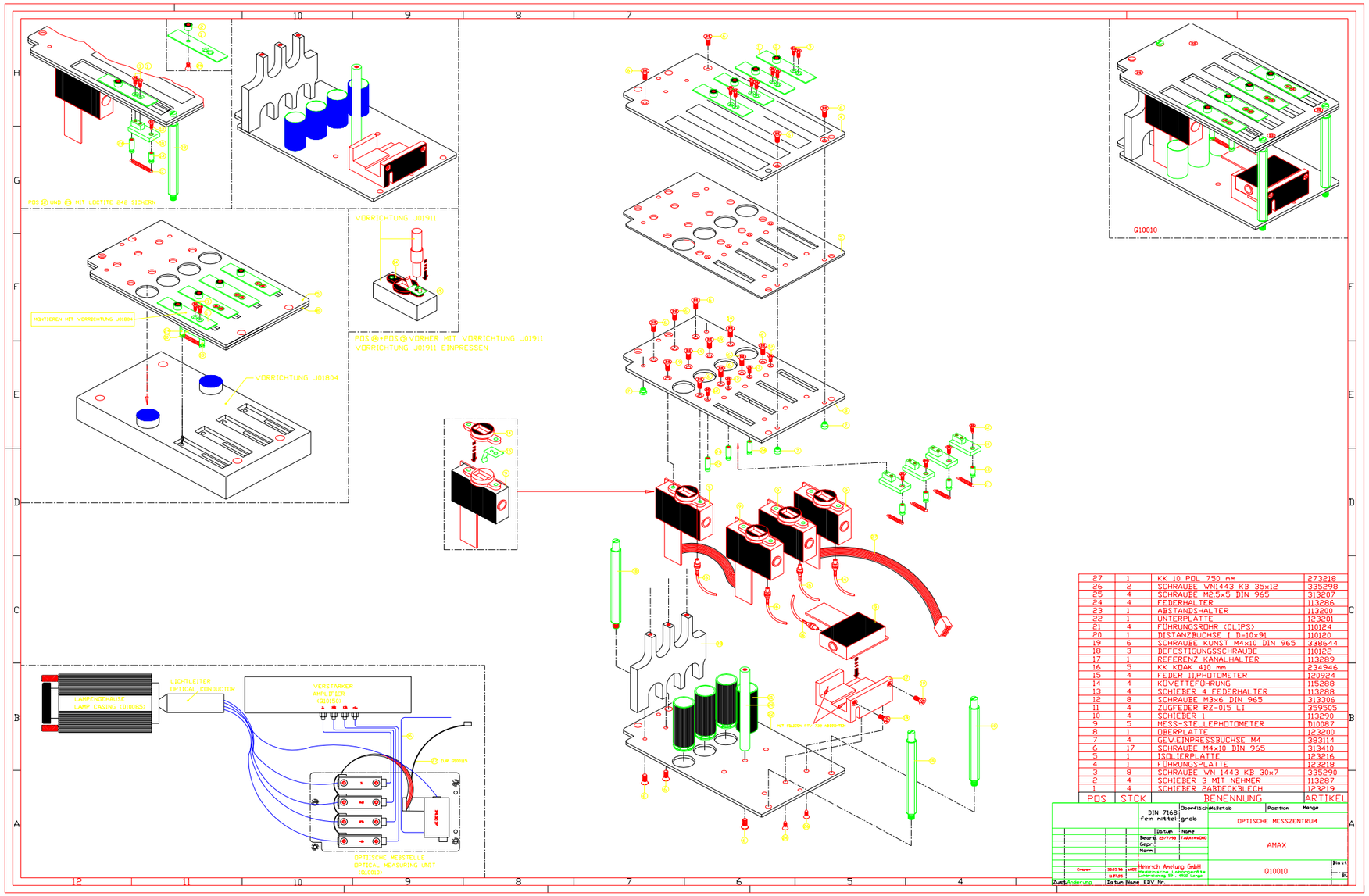


POS	STCK	BENENNUNG	ARTIKEL
111	2	SCHRAUBE M3,5x8 DIN 84	332359
110	1	SCANNER CCD FOKUS 50mm	240019
109			
108	3	KK sB 6,36x420 mm	273417
107	2	KK rot 6,36x420 mm	273416
106	3	SPRITZEL-PUMPSCHLAUCH 120 mm	239001
105	3	ISOLIERUNG KUEHLBLOCK	1E3410
104	1	3-POL BUCHSE AWG	229520
103	1	SCHRUMPFSCHLAUCH 33 mm 16/08	238675
102	1	KK 10-POL 350MM	273053
101			
100	1	KK 6-POL 300Lg	273035
99	1	BUCHSE PONDUIT 8-POL	229529
98	1	KK 5V 13x450	274355
97	1	KK-POTI 12x450	274379
96	13	FEDERRING ø 4,3	352843
95	1	KANTENSCHUTZ PLIO BORD 460 mm	230801
94	3	SCHRAUBE WN 3047	335270
93	1	STECKVERBSTIFT 63x12	341314
92	16	KABELBINDER	230018
91	6	SCHRAUBE M3x8 senkk.	913308
90	1	SCHRAUBE M4x8 DIN 7380	330360
89	1	ZYLSCHRAUBE M4x8 innensechsk.	337458
88	1	KONTAKTBRUECKE	1E0037
87	1	SILICON-SCHLAUCH 2400 mm	239080
86	1	ABFLUSSROHR	1E0731
85	6	SCHRUMPFSCHLAUCH	238325
84	1	WINKELBLECH BARCODELESER	1E3049
83	1	KK 3-POL 410 mm	273418
82	1	U-SCHEIBE A4,3 mm	332543
81	3	SICHERUNGSRING J08	350504
80	1	SEEGERRING J12	350503
79	1	WELLENBUCHSE	113047
78	1	ROLLENKUGELLAGER	391612
77	2	LAGERBUCHSE	113048
76	1	U-SCHEIBE 6,4	331064
75	4	SCHRAUBE M6x16 INNENSECHK.	337415
74	1	ANTRIEBSVELLE	349054
73	1	GEWSTIFT M5x10	329310
72	1	SYNCHRONSCHEIBE COMPL.	1E0796
71	1	LAUFERSCHEIBE 8,4	331084
70	1	MUTTER M8	317008
69	1	ZAHNRIEMEN 10AT5/340	1E0461
68	1	KUEHLRING-P-280	113210
67	4	LINSENSCHRAUBE M3,5x5	339204
66	11	KB-SCHRAUBE 4,8 30x10	330236
65	1	LICHTSCHRANKE DPB 911-W35,9122	249330
64	1	LICHTSCHRANKZWINKEL	1E3080
63	3	SCHRAUBE M8x12 INNENSECHK.	330812
62	3	SCHRAUBE M8x12 INNENSECHK.	330812
61	1	GRUNDBLECHBEFESTIGUNG	1E3014
60	1	ZAHNSCHEIBE	1E0598
59	2	GEWSTIFT M3x3	329305
58	6	GEWEINPRESSBUCHE/KOPF M4	98314
57	1	WELLE	349040
56	1	SICHERUNGSRING J42	350607
55	1	DISTANZHUELSE	110278
54	2	KUGELLAGER	391607
53	2	SICHERUNGSRING	350501
52	1	ZAHNRIEMEN 10 AT5/600	1E0462
51	2	SCHRAUBE 3x16	329316
50	2	RILLEN-KUGELLAGER	1E3247
49	3	ABSTANDSHALTER D20	113209
48			
47	1	ZAHNSCHEIBE	1E0597
46	9	GEWSTIFT M3x4	329304
45	4	LINSENSCHRAUBE M3x4	339304
44	1	MOTORHALTERUNG	113244
43	1	SCHLUMOTOR ESCAP	241140
42	4	ABSTANDSBOLZEN M4x5	122072
41	1	SCHWARZ U RPB-RAD	1E0599
40	1	PLATINE	1E0501
39	1	PLATINE	1E0601
38	2	ABSTANDSHALTER	122091
37	2	LINSENSCHRAUBE M4x35	339435
36	9	LINSENSCHRAUBE M3x30	339330
35	6	FYL-SCHRAUBE M4x6	337406
34	11	FAECHERSCHEIBE 4,3 mm	332043
33	2	DISTANZROLLE 4,5/06	110106
32	3	REGELSCHEIBEL	1E0634
31	1	LAGERUNG mit WASSERABLAUF	113058
30	1	GRUNDBLECH RUEHREINHEIT	1E3079
29	1	FLANSCH	113249
28	1	MASSEBAND	271609
27	4	FAECHERSCHEIBE 2,7	332027
26	1	BLINDSTOPFEN mit DICHTRING	361052
25	1	KUEHLBLECH	110257
24	1	EINZELRUCKMANTRIEB	242220
23	9	LINSENSCHRAUBE M4x6	339436
22	1	LINSENSCHRAUBE M2x10	339210
21	1	U-SCHEIBE A 22 KUNST	331020
20	1	TINDFUEHLER LM 25 MIT BLOCK	1E0701
19	1	3-POL BUCHSE PANDUIT	229302
18	1	DECKELSENSOR KOMPL.	1E0022
17	1	PLATINE PH-T/RPB-RAD	1E0501
16	2	ABSTANDSBOLZEN PA SNK M3x15	370315
15	11	PA-FLACHDICHTUNG SD 42 S07-M3	350012
14	2	SCHRAUBE M3x6 A DIN 7985	339306
13	1	ISOLIERUNG REAGENZRAD	1E3048
12	1	FEDERRING B1	353083
11	9	GEWSTIFT M6x12	329612
10	12	KUNSTSTIFSCHRAUBE M4x20	338420
9	2	KUEHLBLECH	110284
8	3	PELTIER-ELEMENT	266010
7	10	SCHRAUBTELLE	362102
6	2	SCHRAUBE M3x8	339308
5	1	AUFLAGEBLECH RUEHREINHEIT	113045
4	3	ZENTRIERBOLZEN 6mm	113046
3	14	FAECHERSCHEIBE 3,2 mm	332032
2	2	SCHRAUBE M4x6 SENKKOPF	913406
1	2	ZENTRIERBOLZEN 4mm	113043


4- channel photometer
16 bit AD- converter
calculator PCB
over temperature/ regulator failure/ lamp monitoring
9 pin
K 0
K 1
K 2
K 3
photometerchannels
Ref.
photom. lamp
current-
regulator
I/ U converter
analog input
4 x 1 pin
shielded
regul.
+- 15V
channel heating
Ref.
K 3
K 2
K 1
K 0
temperature-
input
referenz-
input
K 0
K 1
K 2
K 3
K 4
K 5
K 6
K 7
K 8
K 9
K 10
K 11
K 12
K 13
K 14
K 15
AD- converter input
A/ D
converter
processor
voltage
regulator
AD- data
15 pin
lamp error
monitor PCB
AD- data
input
AML- bus
Output
calculator
PCB
AML- bus
14 pin
+15V GND photometerlamp
+24V - 24V GND
+24V - 24V GND
+5V GND
power supply

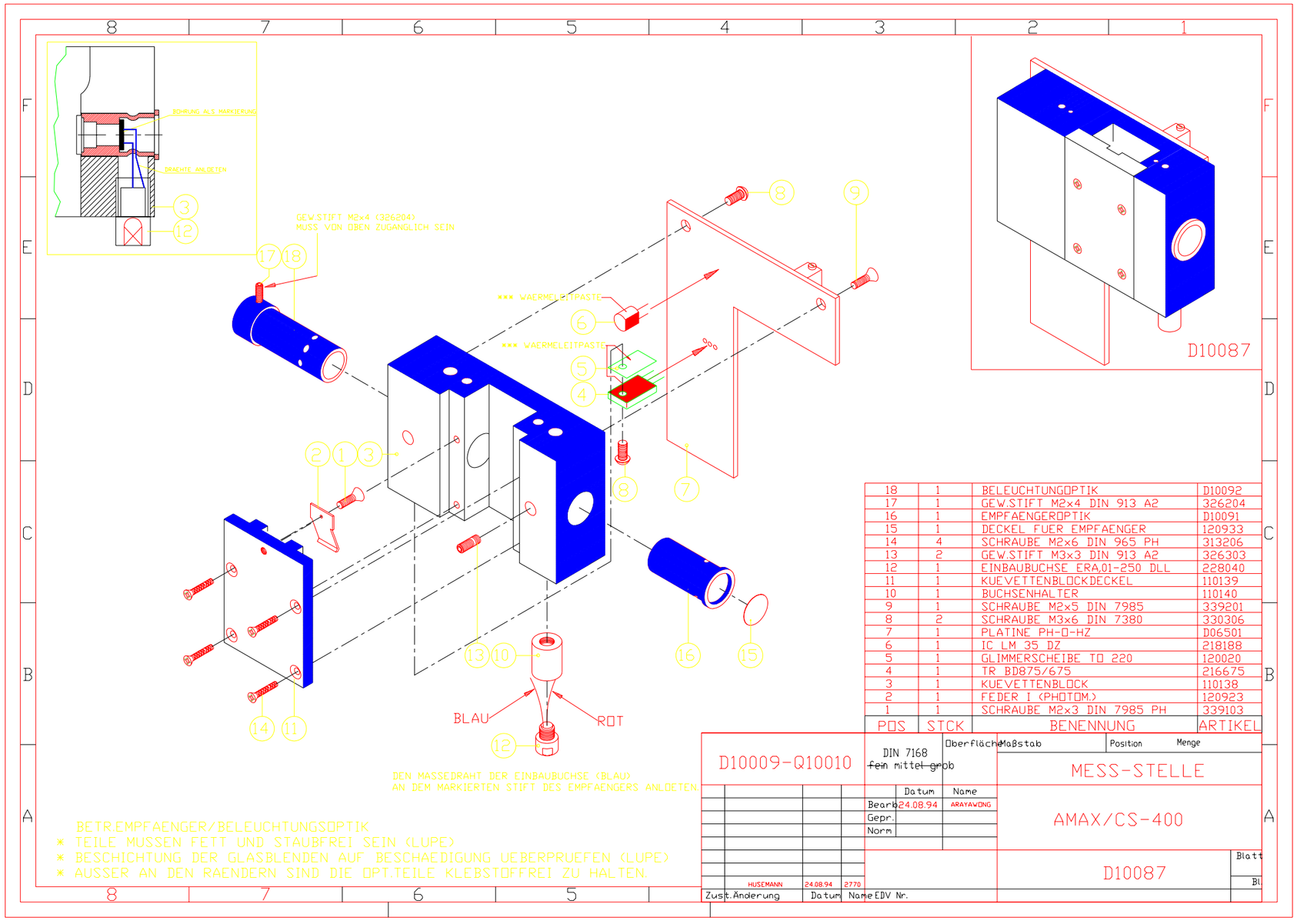
Verdrahtungsplan optische Messeinheit
Optical Measuring Unit Circuit Diagramme





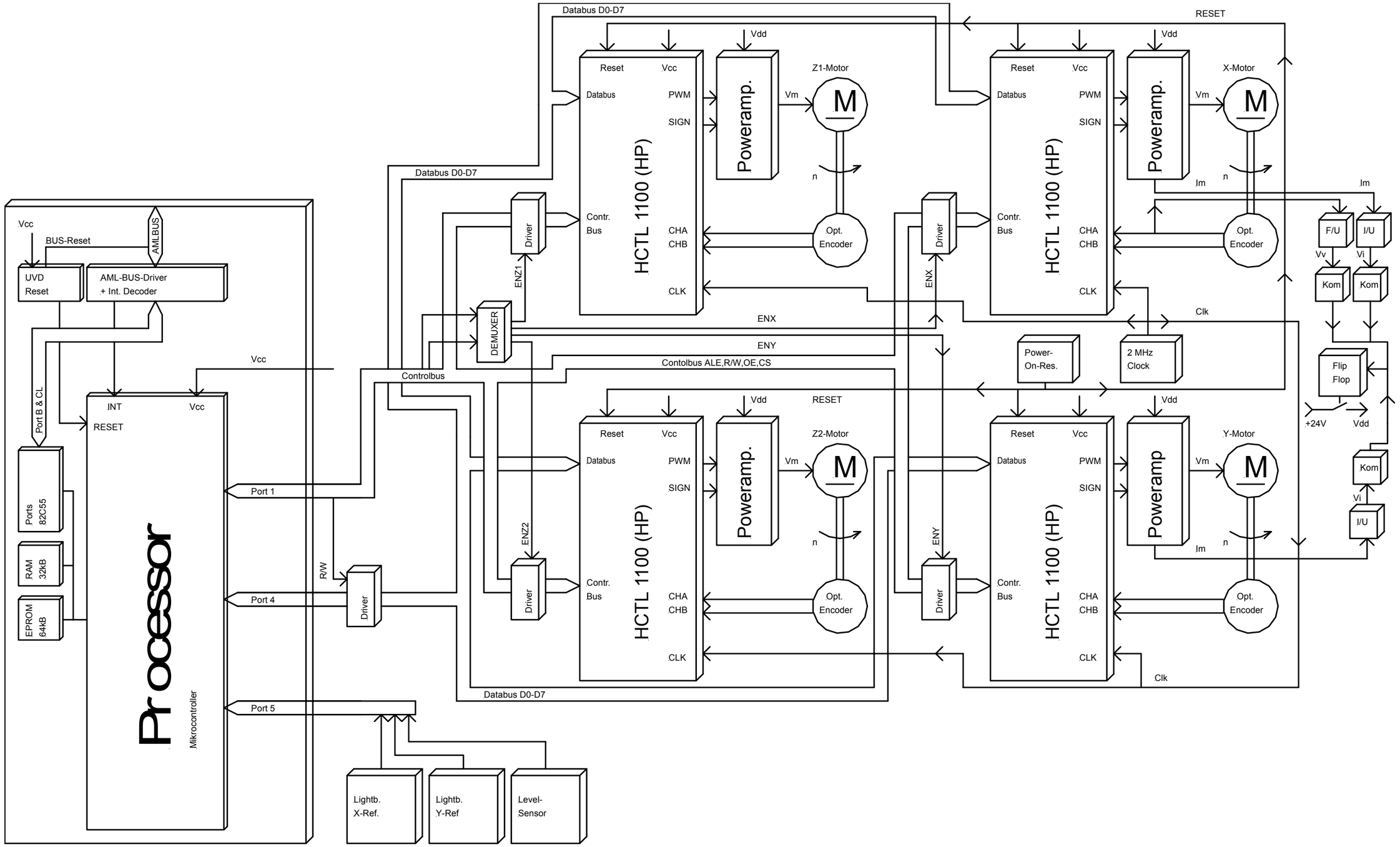
POS	STCK	BENENNUNG	ARTIKEL
27	1	KK 10 PDL 750 mm	273218
26	2	SCHRAUBE WN1443 KB 35x12	335298
25	4	SCHRAUBE M2.5x5 DIN 965	313207
24	4	FEDERHALTER	113286
23	1	ABSTANDSHALTER	113200
22	1	UNTERPLATTE	123201
21	4	FÜHRUNGSROHR (CLIPS)	110124
20	1	DISTANZBUCHSE I D=10x91	110120
19	6	SCHRAUBE KUNST M4x10 DIN 965	338644
18	3	BEFESTIGUNGSSCHRAUBE	110122
17	1	REFERENZ KANALHALTER	113289
16	5	KK KDAK 410 mm	234946
15	4	FEDER II,PHOTOMETER	120924
14	4	KÜVETTEFÜHRUNG	115288
13	4	SCHIEBER 4 FEDERHALTER	113288
12	8	SCHRAUBE M3x6 DIN 965	313306
11	4	ZUGFEDER RZ-015 LI	359505
10	4	SCHIEBER 1	113290
9	5	MESS-STELLEPHOTOMETER	D10087
8	1	OBERPLATTE	123200
7	4	GEW.EINPRESSBUCHSE M4	383114
6	17	SCHRAUBE M4x10 DIN 965	313410
5	1	ISOLIERPLATTE	123216
4	1	FÜHRUNGSPLATTE	123218
3	8	SCHRAUBE WN 1443 KB 30x7	335290
2	4	SCHIEBER 3 MIT NEHMER	113287
1	4	SCHIEBER 2ABDECKBLECH	123219

DIN 7168 fein mittel grob
Oberflächenmaßstab
Position
Menge
OPTISCHE MESSZENTRUM
Datum
Name
Bearb. 25/7/93 TAMAYEVSKI
Gepr.
Norm
AMAX
Owner
Heinrich Amelung GmbH
Q10010
Blatt
Zust. Änderung
Datum
Name
EDV Nr.

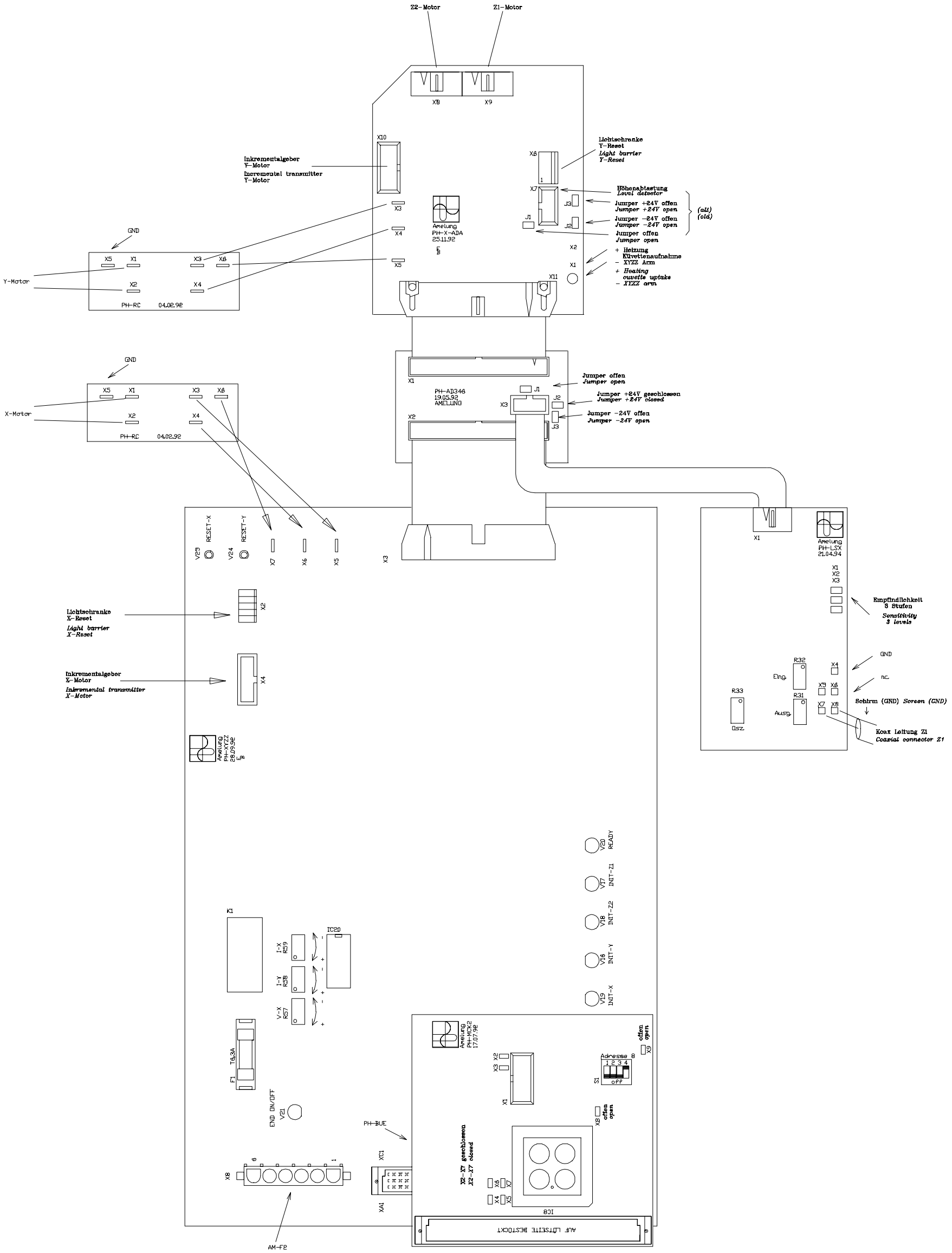


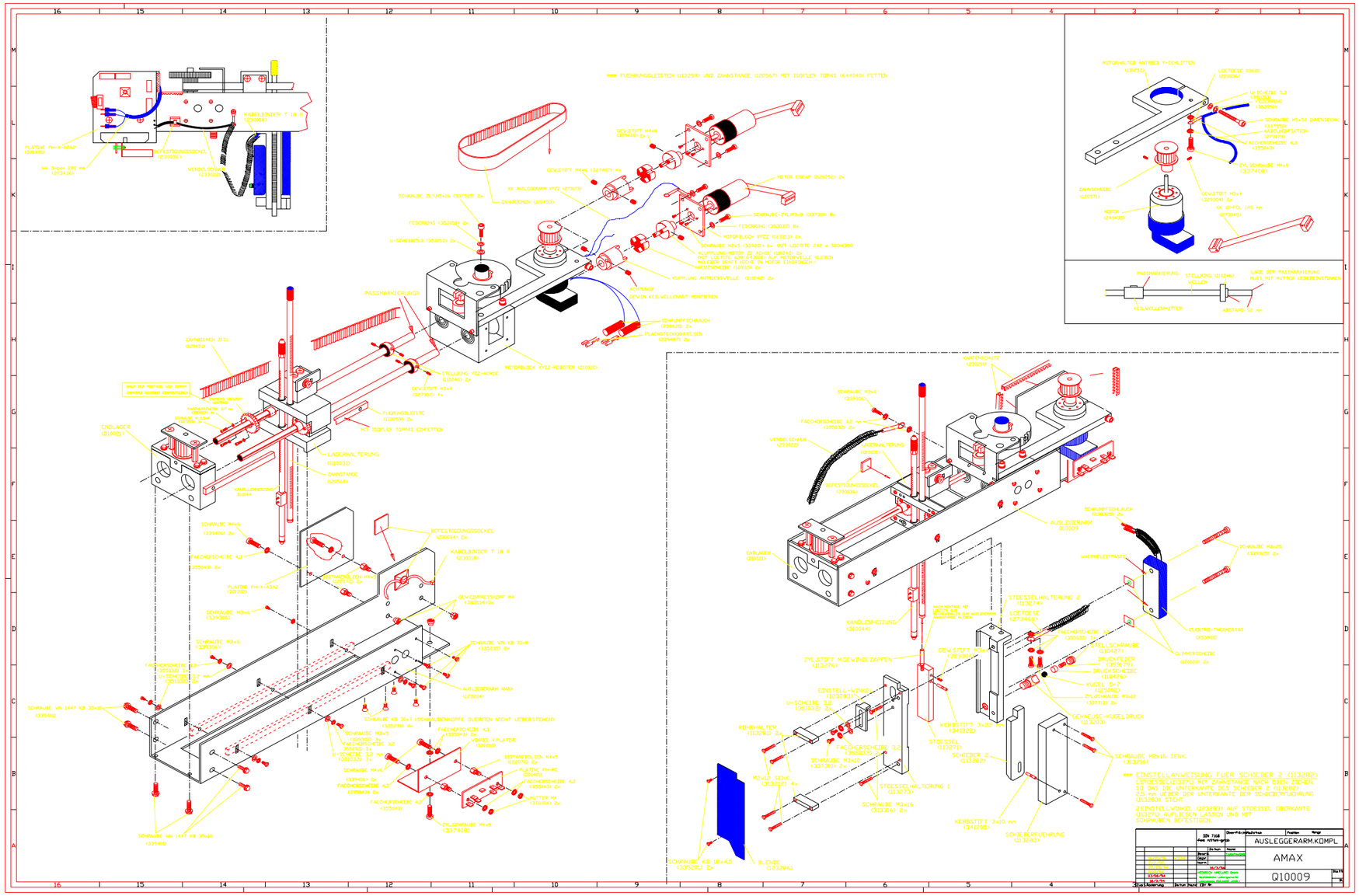
POS	STCK	BENENNUNG	ARTIKEL
18	1	BELEUCHTUNGSOPTIK	D10092
17	1	GEW.STIFT M2x4 DIN 913 A2	326204
16	1	EMPFAENGEROPTIK	D10091
15	1	DECKEL FUER EMPFAENGER	120933
14	4	SCHRAUBE M2x6 DIN 965 PH	313206
13	2	GEW.STIFT M3x3 DIN 913 A2	326303
12	1	EINBAUBUCHSE ERA,01-250 DLL	228040
11	1	KUEVETTENBLOCKDECKEL	110139
10	1	BUCHSENHALTER	110140
9	1	SCHRAUBE M2x5 DIN 7985	339201
8	2	SCHRAUBE M3x6 DIN 7380	330306
7	1	PLATINE PH-O-HZ	D06501
6	1	IC LM 35 DZ	218188
5	1	GLIMMERSCHEIBE TO 220	120020
4	1	TR BD875/675	216675
3	1	KUEVETTENBLOCK	110138
2	1	FEDER I (PHOTOM.)	120923
1	1	SCHRAUBE M2x3 DIN 7985 PH	339103

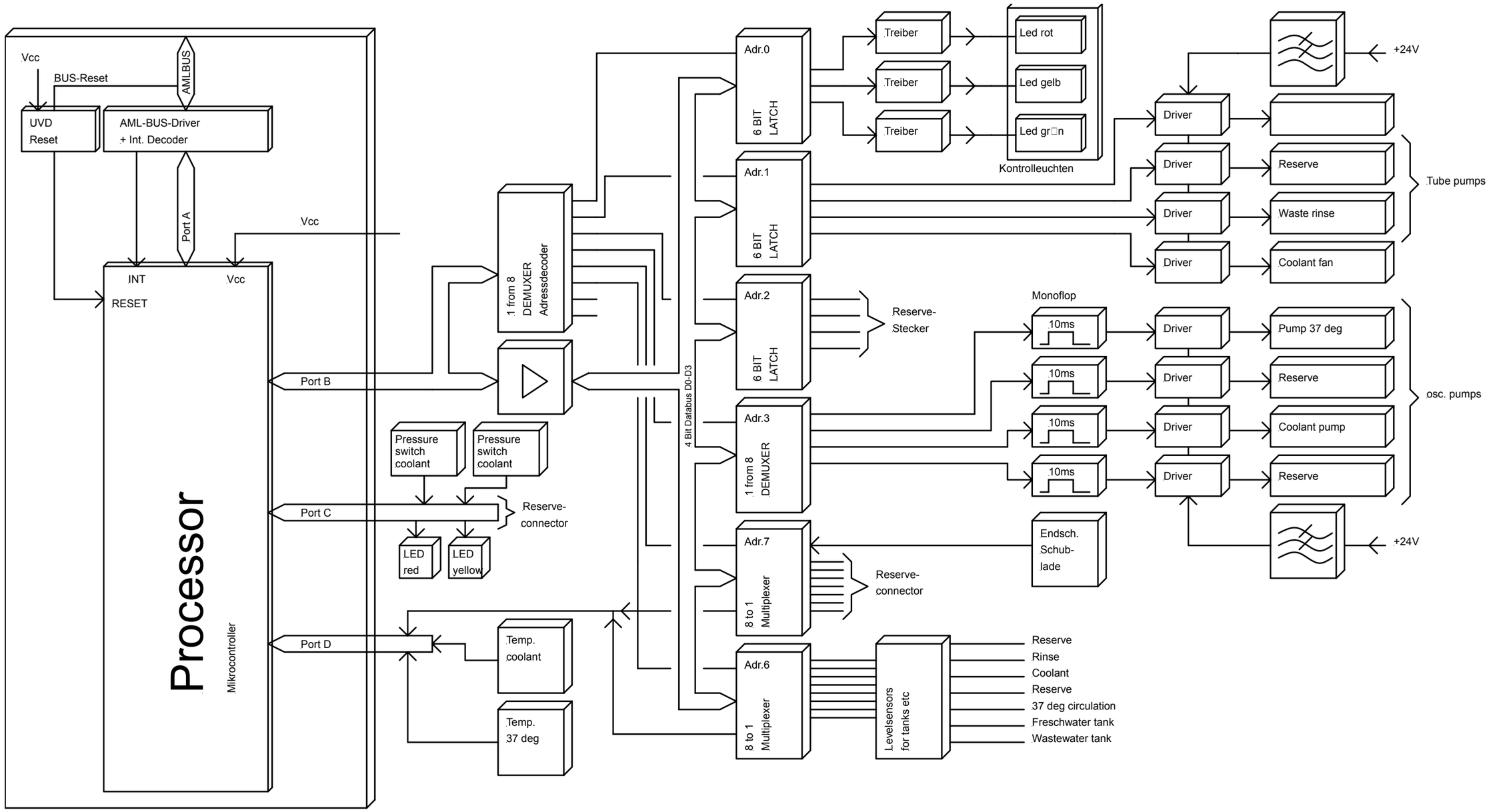
D10009-Q10010				DIN 7168 fein mittel grob	Oberfläche	Maßstab	Position Menge
						MESS-STELLE	
				Datum	Name		
				Bearb. 24.08.94	ARAYAWONG		
				Gepr.		AMAX/CS-400	
				Norm			
						D10087	Blatt
	HUSEMANN	24.08.94	2770				Bl
Zust.	Änderung	Datum	Name	EDV Nr.			


Databus D0-D7
RESET
Vdd
Reset
Vcc
Databus
PWM
SIGN
HCTL 1100 (HP)
Contr.
Bus
CHA
CHB
CLK
Poweramp.
Vm
Z1-Motor
X-Motor
M
n
Opt.
Encoder
Driver
ENZ1
ENX
DEMUXER
Im
F/U
I/U
Vv
Vi
Kom
Clk
Power-
On-Res.
2 MHz
Clock
Flip
Flop
+24V
ENY
Controlbus
Contolbus ALE,R/W,OE,CS
Z2-Motor
Y-Motor
ENZ2
R/W
Port 1
Port 4
Port 5
Port B & CL
Ports
82C55
RAM
32kB
EPROM
64kB
INT
Processor
Mikrocontroller
AMLBUS
BUS-Reset
UVD
Reset
AML-BUS-Driver
+ Int. Decoder
Lightb.
X-Ref.
Lightb.
Y-Ref
Level-
Sensor

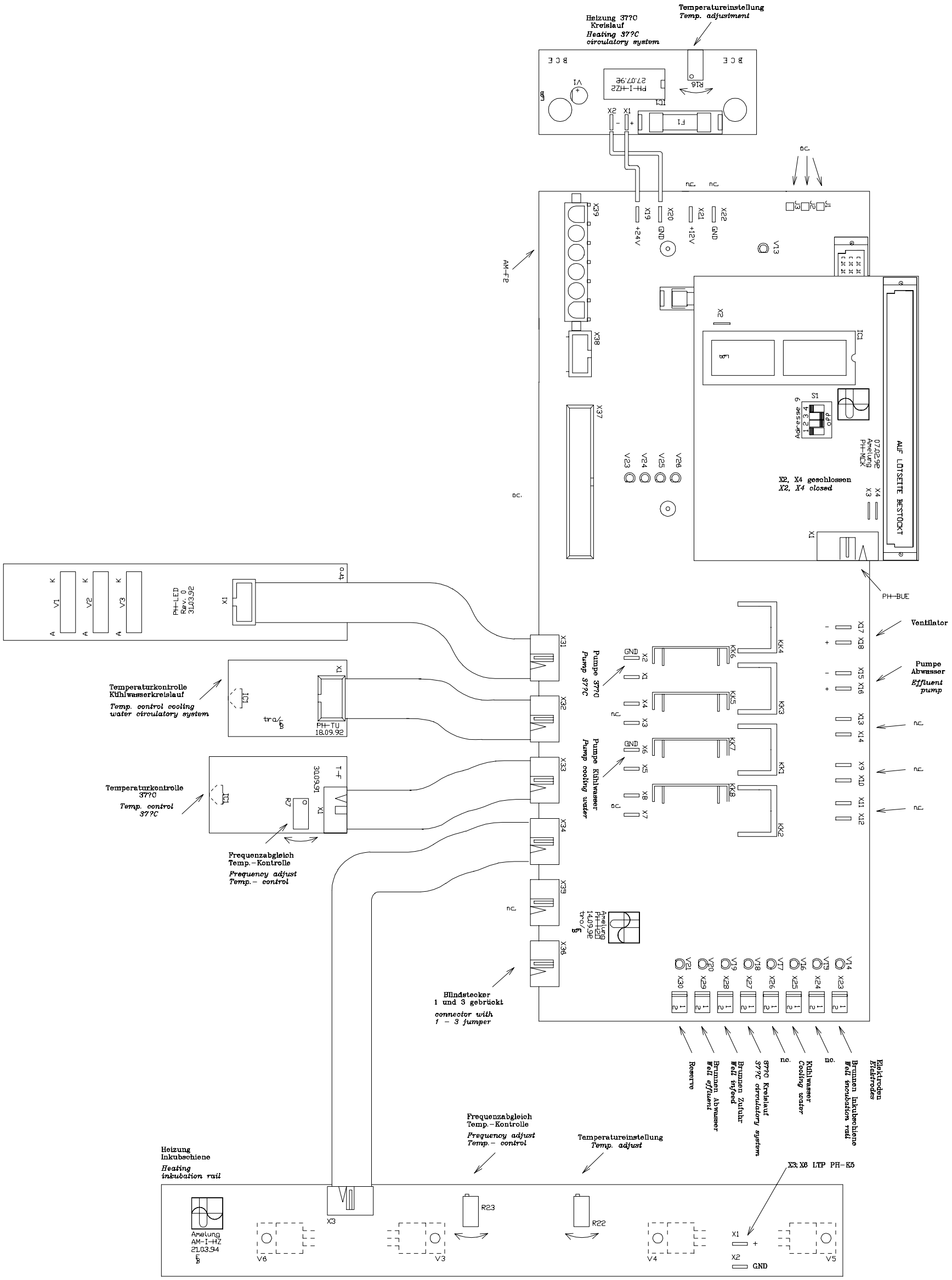
Verdrahtungsplan XYZZ Amax
XYZZ Circuit Diagramme Amax

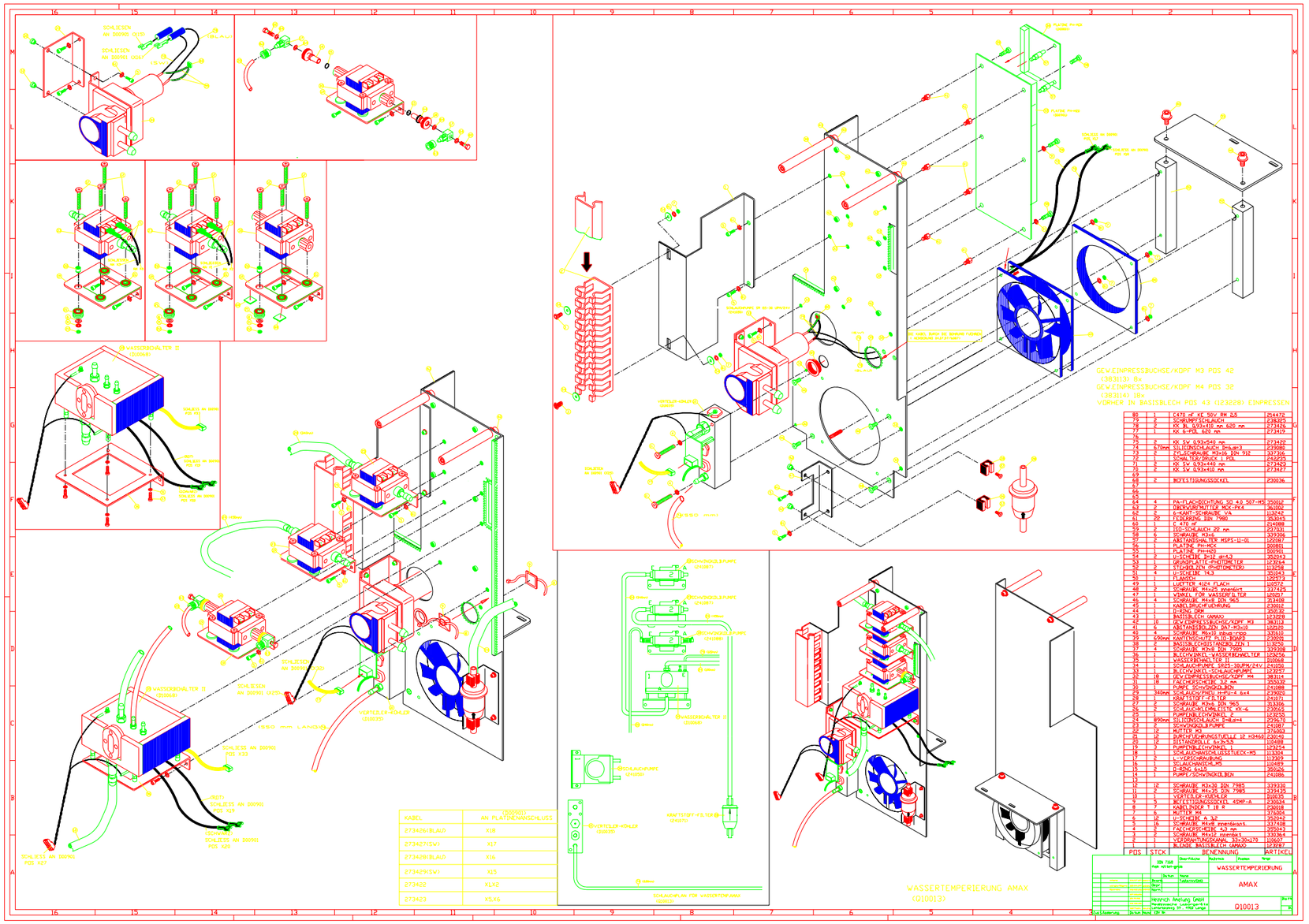


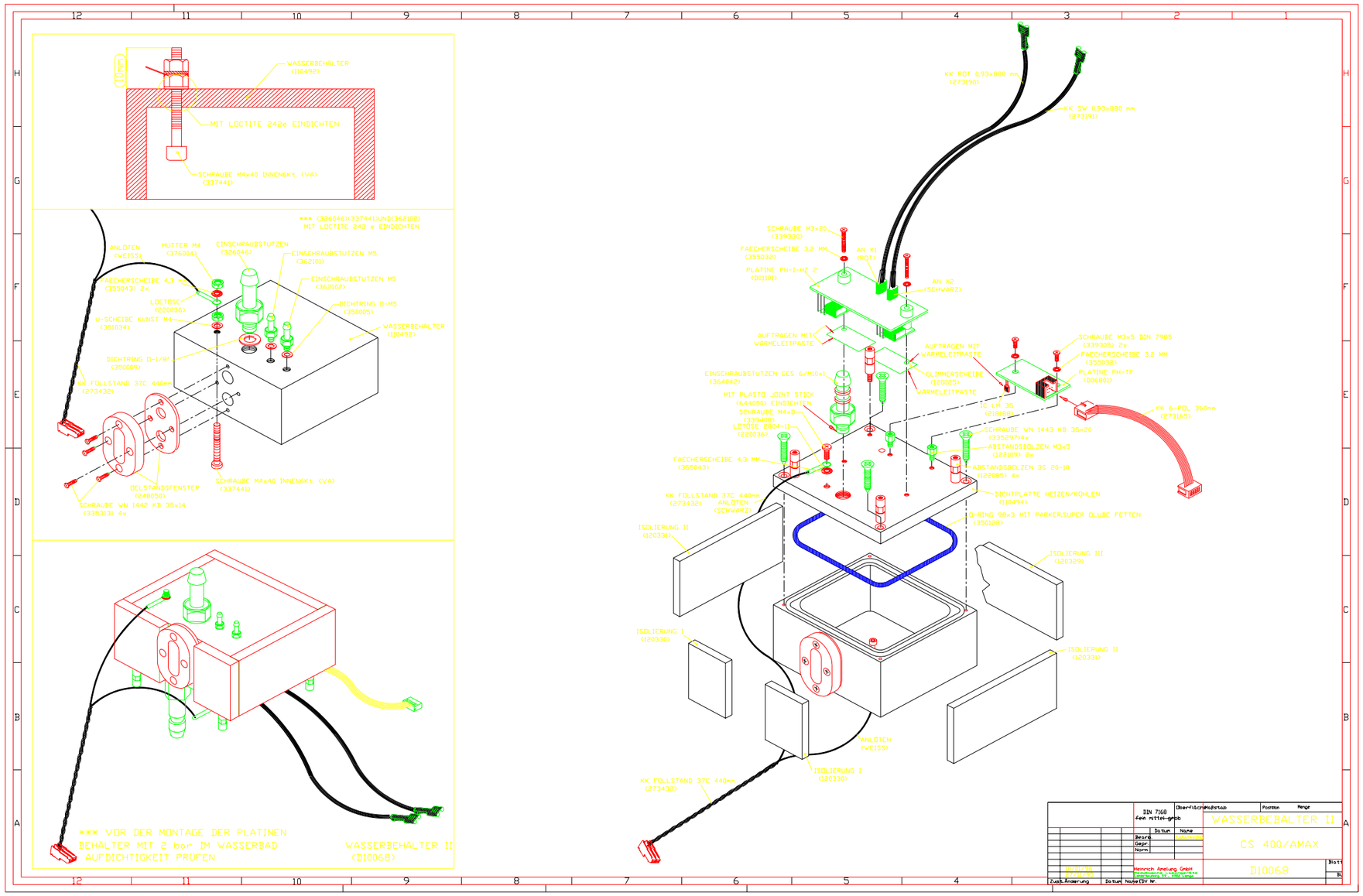

AUSLEGERARM KOMPL.
AMAX
Q10009

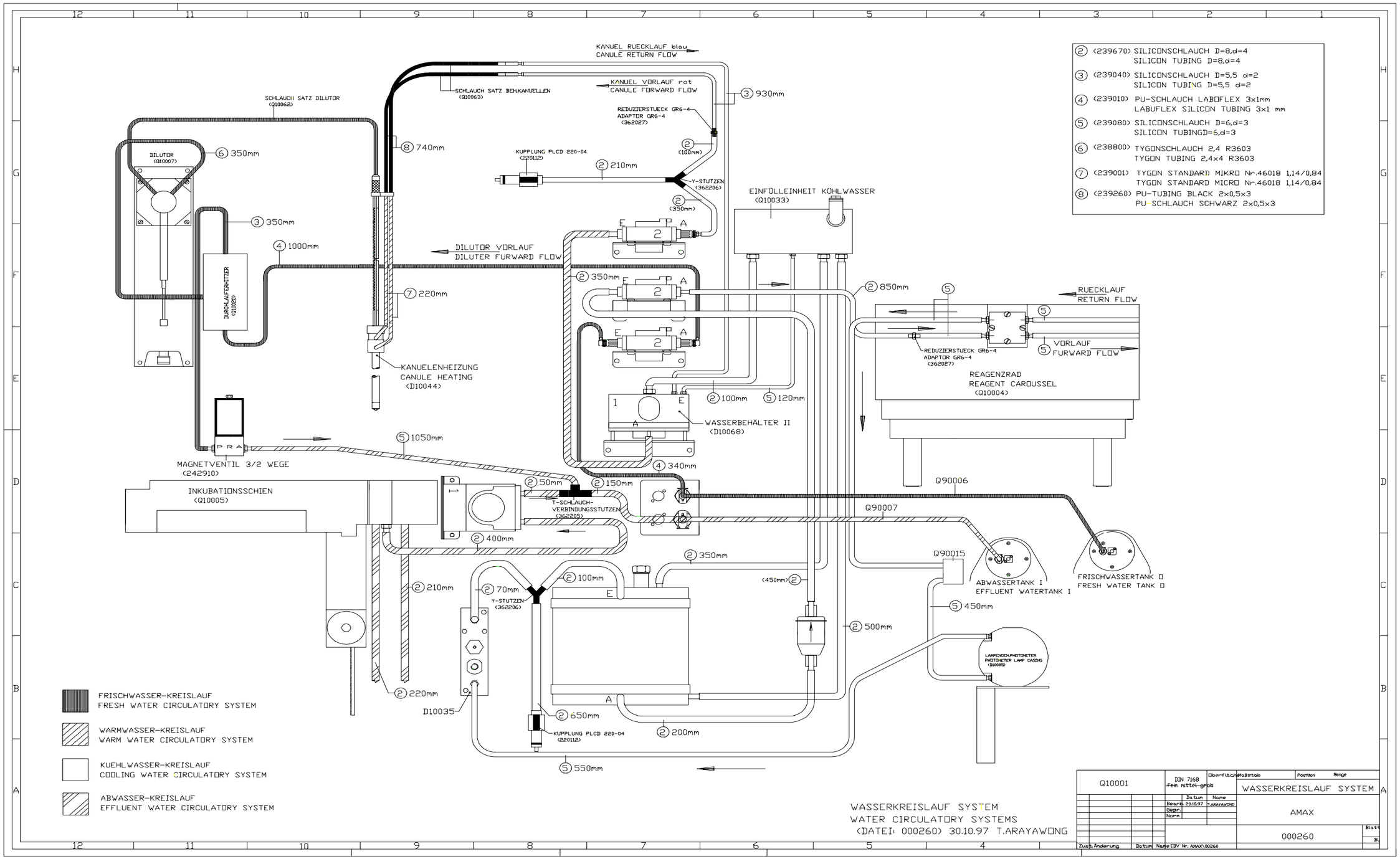

Vcc
BUS-Reset
AMLBUS
UVD
Reset
AML-BUS-Driver
+ Int. Decoder
Port A
Vcc
INT
Vcc
RESET
Port B
Port C
Port D
Processor
Mikrocontroller
1 from 8
DEMUXER
Adressdecoder
4 Bit Databus D0-D3
Pressure
switch
coolant
Pressure
switch
coolant
Reserve-
connector
LED
red
LED
yellow
Temp.
coolant
Temp.
37 deg
Adr.0
6 BIT
LATCH
Adr.1
6 BIT
LATCH
Adr.2
6 BIT
LATCH
Adr.3
1 from 8
DEMUXER
Adr.7
8 to 1
Multiplexer
Adr.6
8 to 1
Multiplexer
Treiber
Treiber
Treiber
Led rot
Led gelb
Led grün
Kontrolleuchten
Reserve-
Stecker
Reserve-
connector
Levelsensors
for tanks etc
Reserve
Rinse
Coolant
Reserve
37 deg circulation
Freschwater tank
Wastewater tank
+24V
Driver
Driver
Driver
Driver
Reserve
Waste rinse
Coolant fan
Tube pumps
Monoflop
10ms
10ms
10ms
Driver
Driver
Driver
Pump 37 deg
Reserve
Coolant pump
Reserve
osc. pumps
Endsch.
Schub-
lade
+24V

Verdrahtungsplan Wasserkreislauf Amax
Water Circulatory System Circuit Diagramme




WASSERTEMPERIERUNG AMAX
(Q10013)
AMAX
Q10013

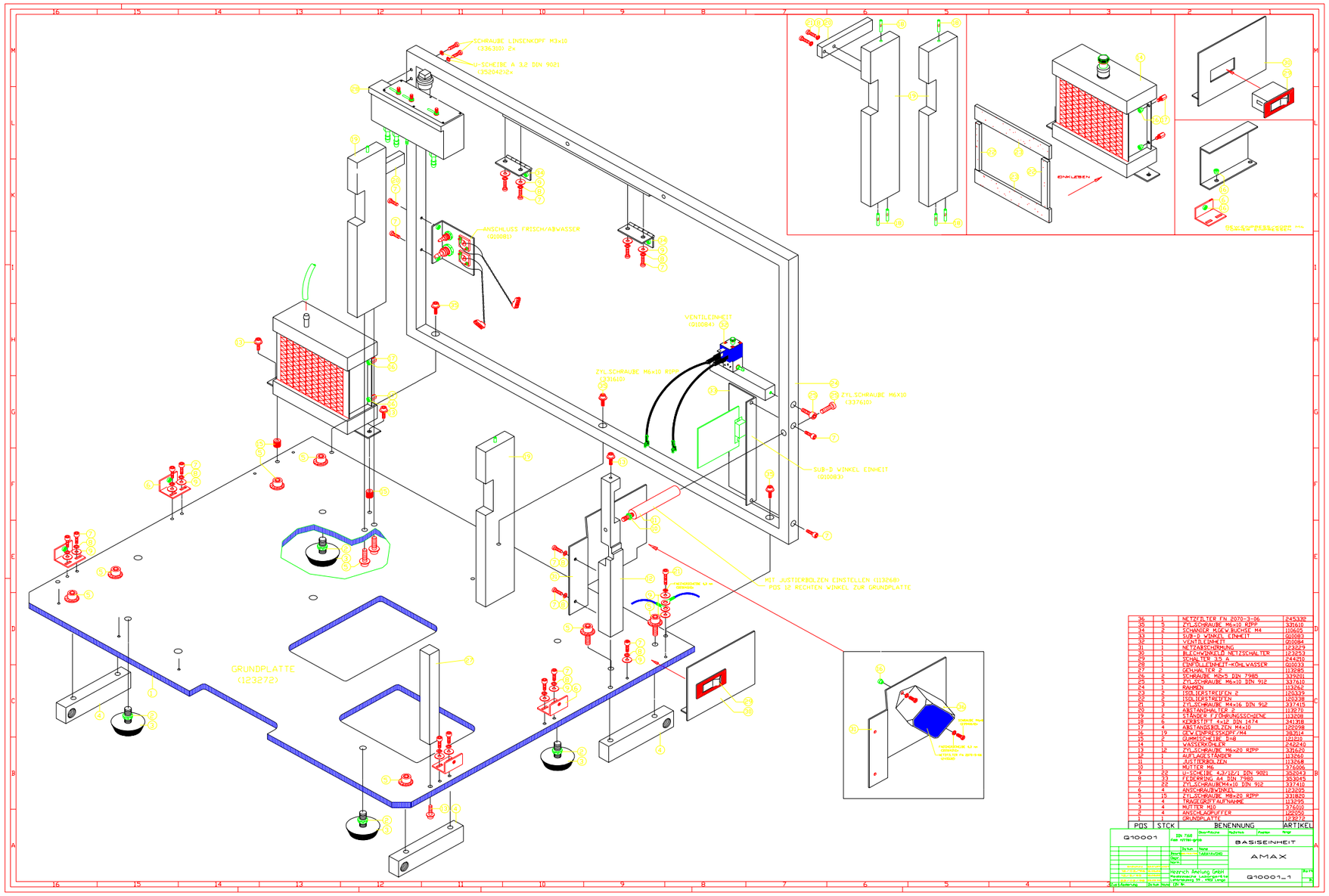

WASSERBEHALTER (110492)
MIT LOCTITE 242e EINDICHTEN
SCHRAUBE M4x40 INNENGKt. (VA) (337441)
*** (326046)(337441)UND(362102) MIT LOCTITE 242 e EINDICHTEN
ANLÖTEN (WEISS)
MUTTER M4 (376004)
EINSCHRAUBSTUTZEN (326046)
EINSCHRAUBSTUTZEN M5 (362101)
EINSCHRAUBSTUTZEN M5 (362102)
FACHERSCHEIBE 4.3 (355043) 2x
LOETOSE (220036)
DICHTRING O-M5 (350005)
U-SCHEIBE KUNST M4 (351034)
WASSERBEHALTER (110492)
DICHTRING O-1/8" (350009)
KK FÜLLSTAND 37C 440mm (273432)
DELSTANDSFENSTER (248050)
SCHRAUBE WN 1442 KB 35x14 (335313) 4x
*** VOR DER MONTAGE DER PLATINEN BEHÄLTER MIT 2 bar IM WASSERBAD AUFDICHTIGKEIT PRÜFEN
WASSERBEHÄLTER II (D10068)
KK RDT 0,93x880 mm (273190)
KK SW 0,93x880 mm (273191)
SCHRAUBE M3x20 (339320)
FACHERSCHEIBE 3.2 MM (355032)
AN X1 (RDT)
PLATINE PH-I-HZ 2 (D0110)
AN X2 (SCHWARZ)
AUFTRAGEN MIT WÄRMELEITPASTE
SCHRAUBE M3x5 DIN 7985 (339305) 2x
FACHERSCHEIBE 3.2 MM (355032)
PLATINE PH-TF (D06801)
EINSCHRAUBSTUTZEN GES 6/M10x1 (364042)
GLIMMERSCHEIBE (120025)
MIT PLASTO JOINT STICK (644050) EINDICHTEN
SCHRAUBE M4x8 (339408)
LOTOSE 2804-11 (220036)
TC LM 35 (218190)
KK 6-POL 360mm (273165)
SCHRAUBE WN 1442 KB 35x20 (335297)4x
ABSTANDSBOLZEN M3x5 (121109) 2x
FACHERSCHEIBE 4.3 MM (355043)
ABSTANDSBOLZEN 3S 20-10 (122965) 4x
KK FÜLLSTAND 37C 440mm (273432) ANLÖTEN (SCHWARZ)
DICHTPLATTE HEIZEN/KÜHLEN (110494)
O-RING 98x3 MIT PARKER,SUPER OLUBE FETTEN (350128)
ISOLIERUNG II (120331)
ISOLIERUNG III (160329)
ISOLIERUNG I (120330)
ISOLIERUNG II (120331)
ANLÖTEN (WEISS)
KK FÜLLSTAND 37C 440mm (273432)
ISOLIERUNG I (120330)
DIN 7168 fein mittel-grob
Oberflächenbehandlung
Position
Menge
Datum
Name
Bearb.
Gepr.
Norm.
WASSERBEHÄLTER II
CS 400/AMAX
D10068
Heinrich Amelung GmbH
Zust. Änderung
Datum
Name
ESV Nr.



(2)	(239670)	SILICONSCHLAUCH D=8,d=4 SILICON TUBING D=8,d=4
(3)	(239040)	SILICONSCHLAUCH D=5,5 d=2 SILICON TUBING D=5,5 d=2
(4)	(239010)	PU-SCHLAUCH LABOFLEX 3x1mm LABUFLEX SILICON TUBING 3x1 mm
(5)	(239080)	SILICONSCHLAUCH D=6,d=3 SILICON TUBINGD=6,d=3
(6)	(238800)	TYGONSCHLAUCH 2,4 R3603 TYGON TUBING 2,4x4 R3603
(7)	(239001)	TYGON STANDARD MIKRO Nr.46018 1,14/0,84 TYGON STANDARD MICRO Nr.46018 1,14/0,84
(8)	(239260)	PU-TUBING BLACK 2x0,5x3 PU-SCHLAUCH SCHWARZ 2x0,5x3

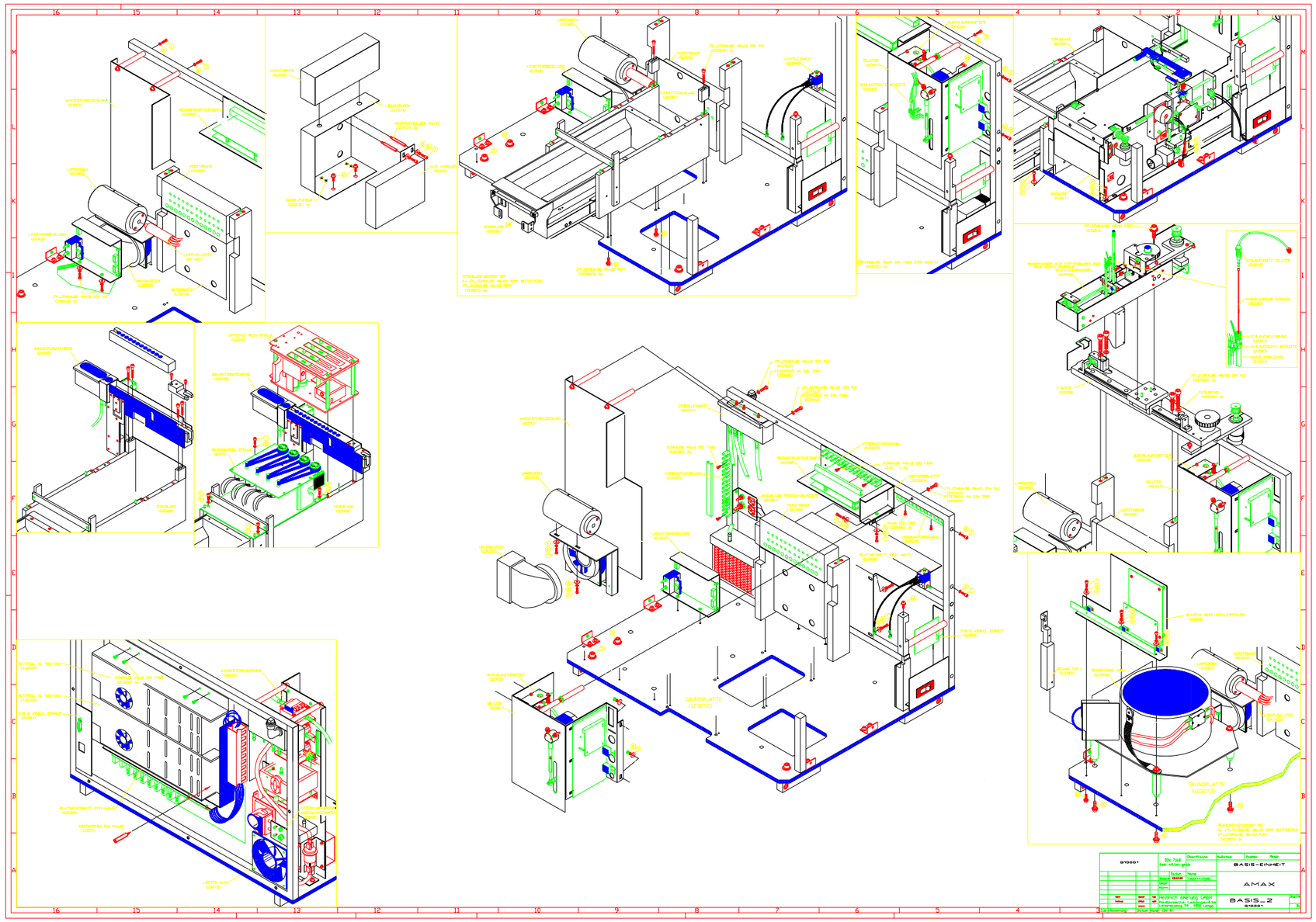
WASSERKREISLAUF SYSTEM
WATER CIRCULATORY SYSTEMS
(DATEI: 000260) 30.10.97 T.ARAYAWONG

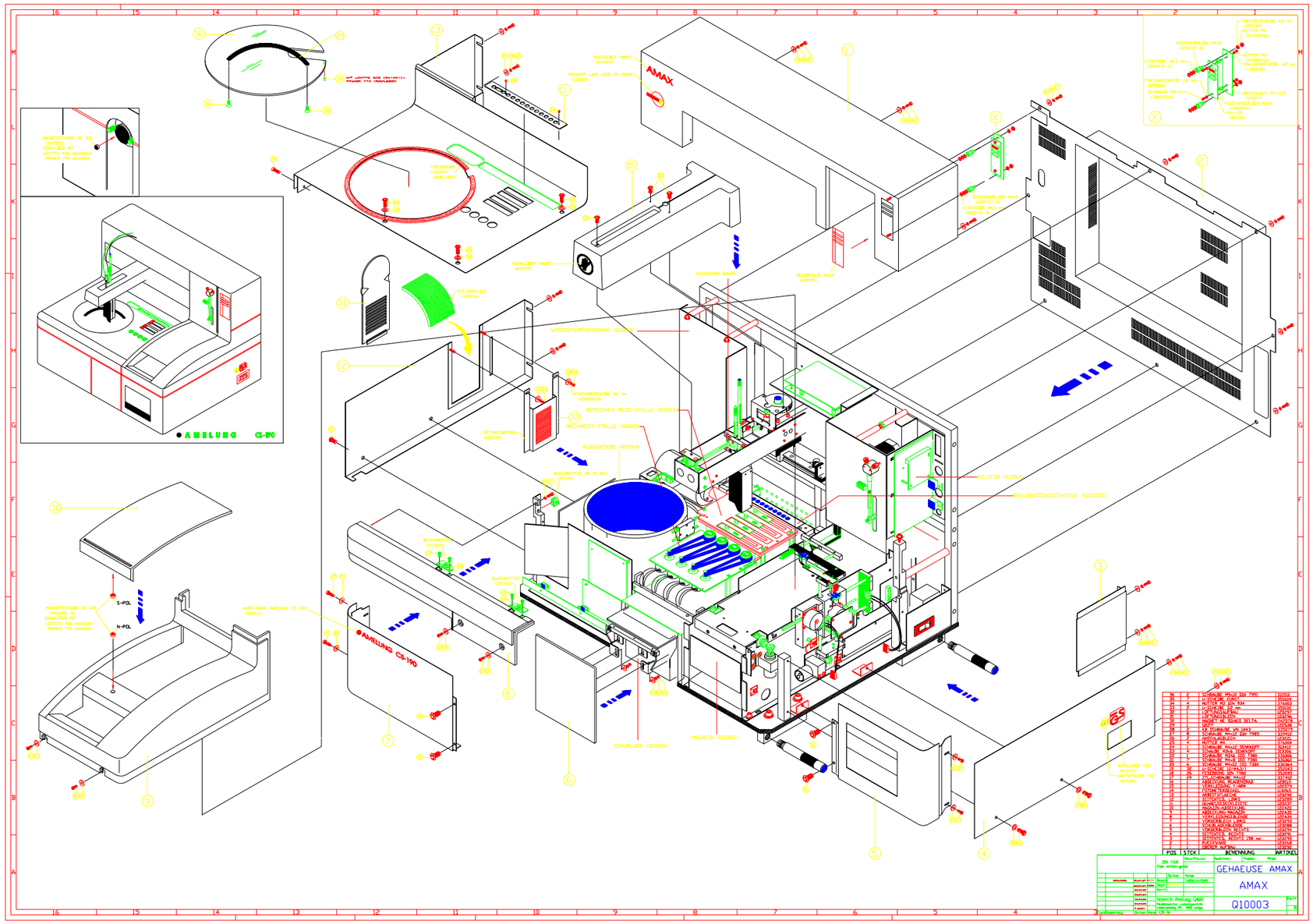
Q10001			DIN 7168 fein mittel grob		Oberfläche	Maßstab	Position / Menge
				Datum	Name	WASSERKREISLAUF SYSTEM	
			Bearb.	20.10.97	T.ARAYAWONG		
			Gepr.			AMAX	
			Norm				
						000260	Blatt
Zust.	Änderung	Datum	Name	EDV Nr. AMAX\000260			

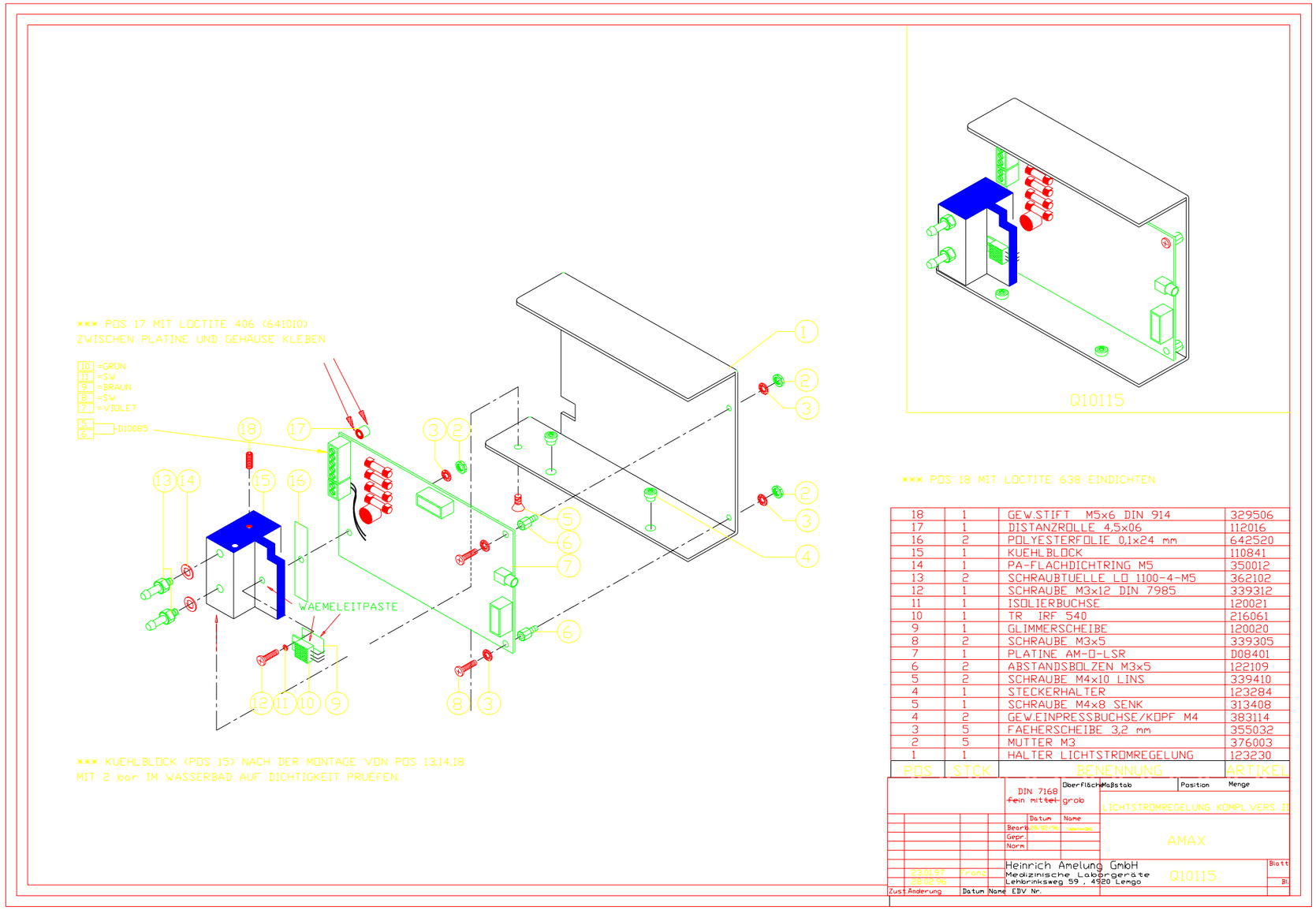


POS	STCK	BENENNUNG	ARTIKEL
36	1	NETZFILTER FN 2070-3-06	245332
35	5	ZYLSCHRAUBE M6x10 RIPP	337610
34	2	SCHANIER M3EW BUCHSE M4	110605
33	1	SUB-D WINKEL EINHEIT	Q10083
32	1	VENTILEINHEIT	Q10084
31	1	NETZABSCHIRMUNG	123823
30	1	BLECHWINKELN NETZSCHALTER	123353
29	1	SCHALTER 15 A	244210
28	1	EINFÜLLEINHEIT-FRISCHWASSER	Q10033
27	1	GEHÄUSETEIL 2	113285
26	2	SCHRAUBE M3x5 DIN 7985	337201
25	5	ZYLSCHRAUBE M6x10 DIN 912	337610
24	1	RAHMEN	113264
23	2	1908 DICHTSTREIFEN 2	120339
22	2	1908 DICHTSTREIFEN	120338
21	3	ZYLSCHRAUBE M4x16 DIN 912	337415
20	1	ABSTANDHALTER 3	113270
19	2	STÄNDER F. FÜHRUNGSSCHIENE	113308
18	6	KERBSTIFT 4x12 ISO 1474	241318
17	4	ABSTANDSBOLZEN M4x10	120298
16	19	GEWINDPRESSKOPF/M4	382114
15	2	GUMMISCHEIBE D=8	121010
14	1	WASSERSCHLEIFE	242240
13	12	ZYLSCHRAUBE M6x20 RIPP	337620
12	1	AUFLAGESTÄNDER	113260
11	1	JUSTIERBOLZEN	113268
10	1	MUTTER M6	376006
9	22	U-SCHEIBE 6,3x12/1 DIN 9021	353243
8	33	FEDERRING A4 DIN 7980	353045
7	22	ZYLSCHRAUBEM4x10 DIN 912	337410
6	4	ANSCHRAUBWINKEL	123205
5	15	ZYLSCHRAUBE M8x20 RIPP	331820
4	4	TRAGEORTAUFNAHME	113295
3	4	MUTTER M10	376010
2	4	ANSCHLAGPUFFER	120090
1	1	GRUNDPLATTE	123272

Q10001 — BASISEINHEIT — AMAX — Q10001_1

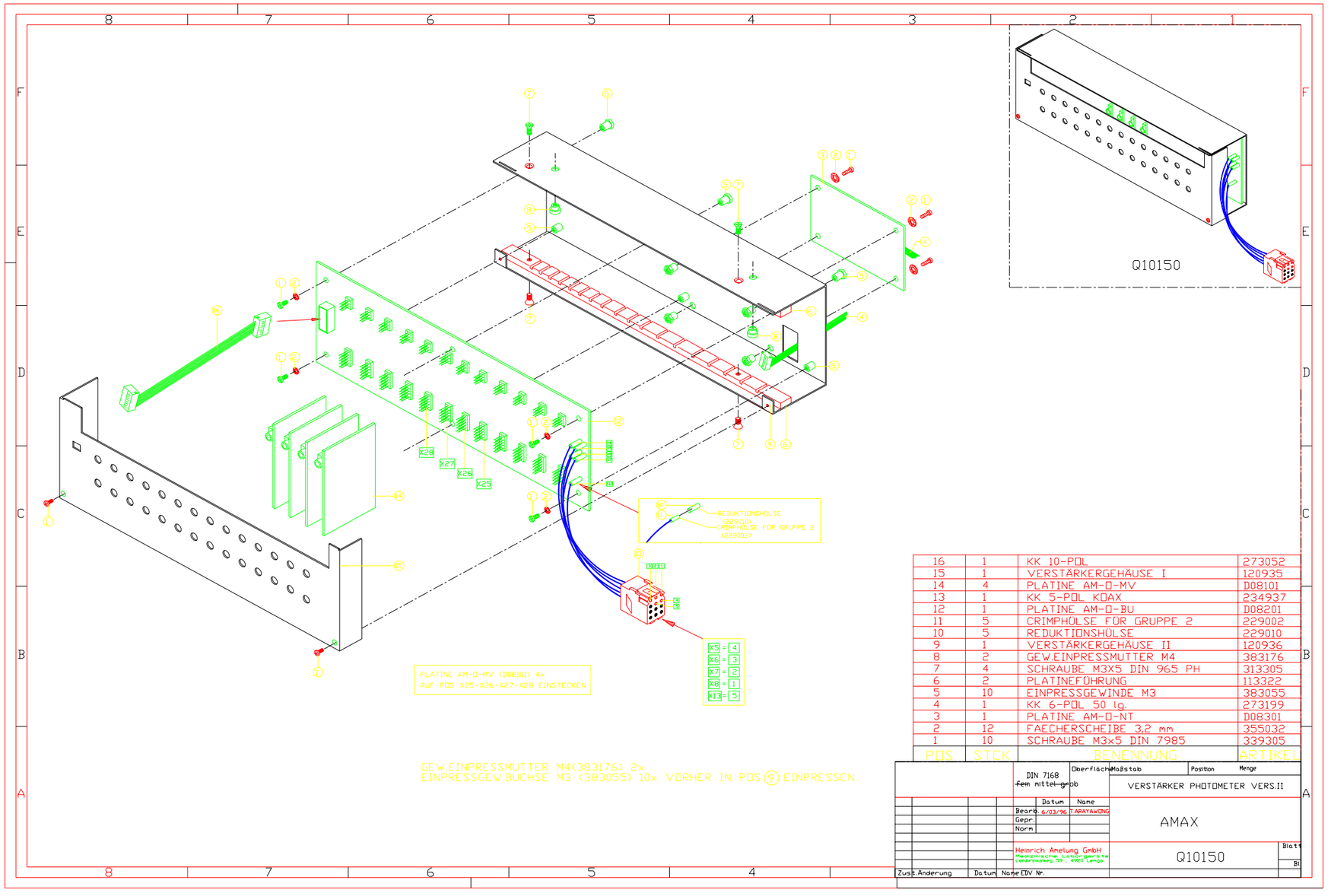

GRUNDPLATTE
(123272)
BASIS-EINHEIT
AMAX
BASIS_2


AMAX
● AMELUNG CS-190
S-POL
N-POL
GEHAEUSE AMAX
AMAX
Q10003



POS	STCK	BENENNUNG	ARTIKEL
18	1	GEW.STIFT M5x6 DIN 914	329506
17	1	DISTANZROLLE 4,5x06	112016
16	2	POLYESTERFOLIE 0,1x24 mm	642520
15	1	KUEHLBLOCK	110841
14	1	PA-FLACHDICHTRING M5	350012
13	2	SCHRAUBTUELLE LO 1100-4-M5	362102
12	1	SCHRAUBE M3x12 DIN 7985	339312
11	1	ISOLIERBUCHSE	120021
10	1	TR IRF 540	216061
9	1	GLIMMERSCHEIBE	120020
8	2	SCHRAUBE M3x5	339305
7	1	PLATINE AM-D-LSR	D08401
6	2	ABSTANDSBOLZEN M3x5	122109
5	2	SCHRAUBE M4x10 LINS	339410
4	1	STECKERHALTER	123284
5	1	SCHRAUBE M4x8 SENK	313408
4	2	GEW.EINPRESSBUCHSE/KOPF M4	383114
3	5	FAEHERSCHEIBE 3,2 mm	355032
2	5	MUTTER M3	376003
1	1	HALTER LICHTSTROMREGELUNG	123230

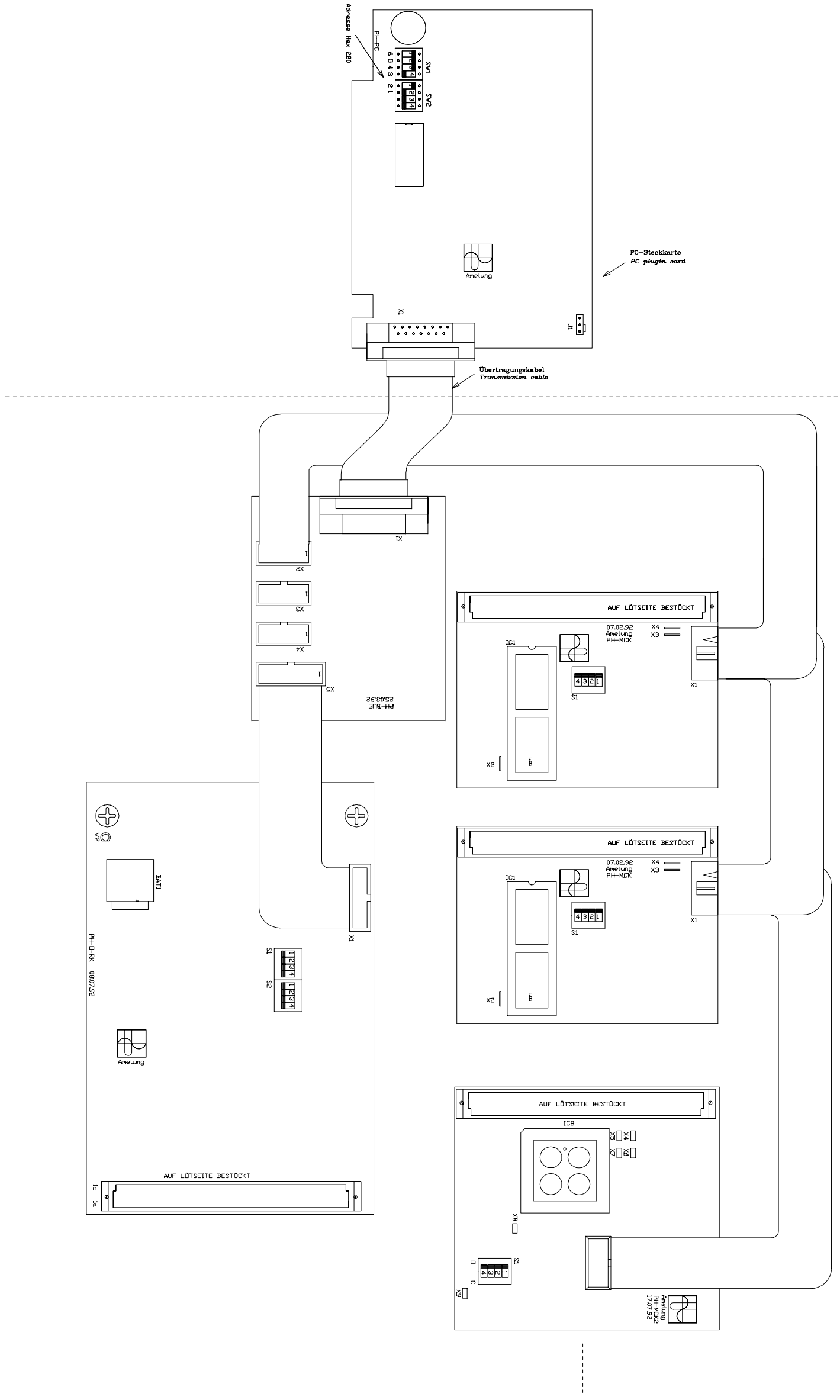
DIN 7168 fein mittel grob | Oberfläche | Maßstab | Position | Menge
LICHTSTROMREGELUNG KOMPL.VERS II
Datum | Name
Bearb. 28/02/96 Lawrenz
Gepr.
Norm
AMAX
Heinrich Amelung GmbH
Medizinische Laborgeräte
Lehbrinksweg 59 , 4920 Lemgo
Q10115
Blatt
23.01.97 Franz
28.02.96
Zust. Änderung | Datum Name | EDV Nr.

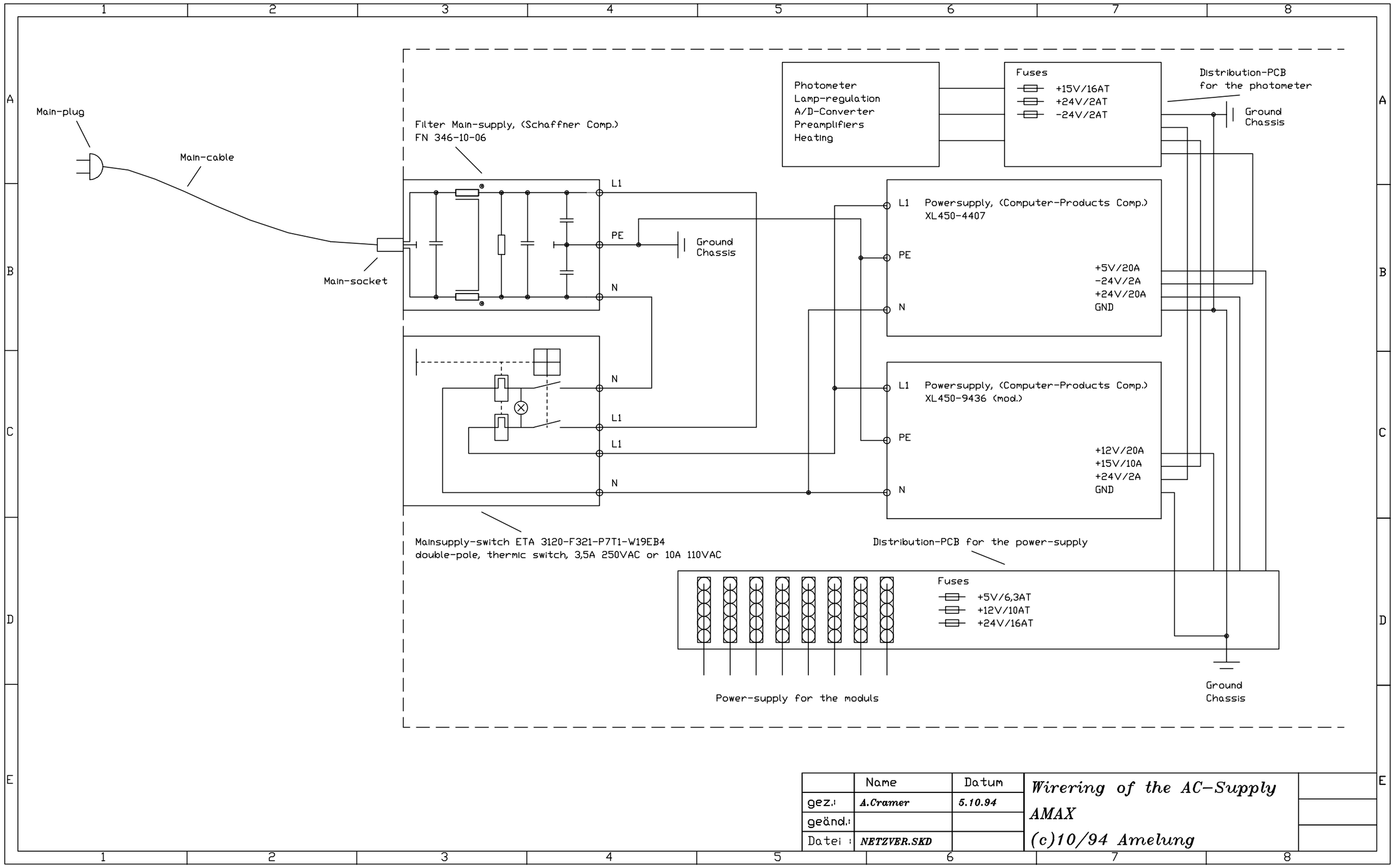


POS	STCK	BENENNUNG	ARTIKEL
16	1	KK 10-POL	273052
15	1	VERSTÄRKERGEHÄUSE I	120935
14	4	PLATINE AM-D-MV	D08101
13	1	KK 5-POL KOAX	234937
12	1	PLATINE AM-D-BU	D08201
11	5	CRIMPHÜLSE FÜR GRUPPE 2	229002
10	5	REDUKTIONSHÜLSE	229010
9	1	VERSTÄRKERGEHÄUSE II	120936
8	2	GEW.EINPRESSMUTTER M4	383176
7	4	SCHRAUBE M3X5 DIN 965 PH	313305
6	2	PLATINEFÜHRUNG	113322
5	10	EINPRESSGEWINDE M3	383055
4	1	KK 6-POL 50 lg.	273199
3	1	PLATINE AM-D-NT	D08301
2	12	FAECHERSCHEIBE 3,2 mm	355032
1	10	SCHRAUBE M3x5 DIN 7985	339305

		DIN 7168 fein mittel grob	Oberfläche	Maßstab	Position	Menge
			VERSTÄRKER PHOTOMETER VERS.II			
			Datum	Name		
		Bearb.	6/03/96	T.ARAYAWONG		
		Gepr.				
		Norm				
		Heinrich Amelung GmbH Medizinische Laborgeräte Lemgo	AMAX			
			Q10150			Blatt
Zust.	Änderung	Datum	Name	EDV Nr.		Bl

Verdrahtungsplan PC-AMAX
PC-AMAX Circuit Diagramme





	Name	Datum	
gez.:	*A.Cramer*	*5.10.94*	*Wirering of the AC-Supply AMAX*
geänd.:			*(c)10/94 Amelung*
Datei :	*NETZVER.SKD*		

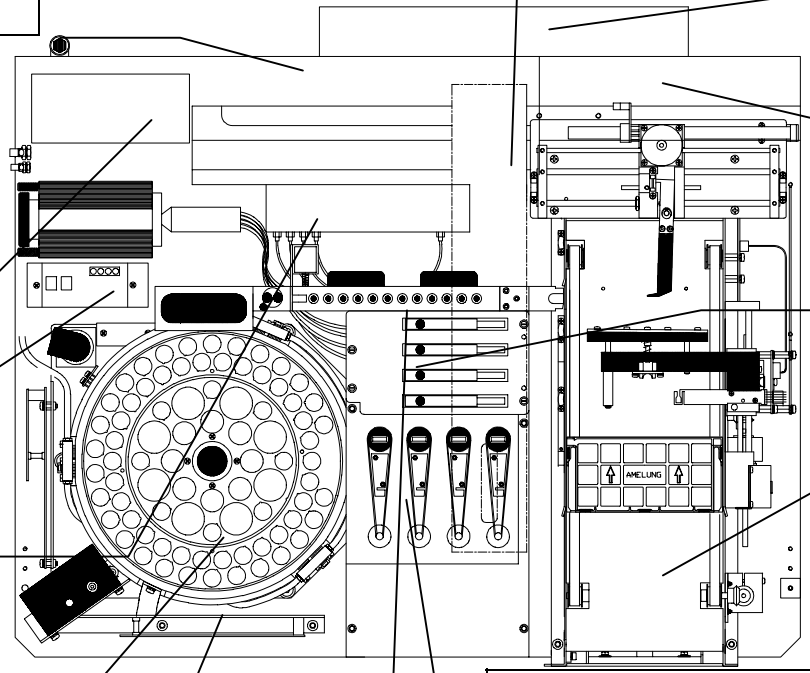
Modul XYZZ-Cantilever
- Platine PH-XYZZ (D00101)
- Platine PH-MCK II (D03601)
- Platine PH-AD346 (D01801)
- Platine PH-RC (D01401)
- Platine AM-F2 (D01701)

XYZZ-Cantilever
Platine PH-X-ADA II (D01302)
Platine PH-RC (D01401)

Power Supply
- Netzteil (245520)
- Netzteil (245525)

Water Temperature
- Platine PH-H2O (D00901)
- Platine PH-MCK (D00801)
- Platine PH-TU (D02601)
- Platine PH-TF (D06801)
- Platine PH-I-HZ2 (D01101)
- Platine PH-LED (D01501)

Dilutor
- Platine AM-DIL (D05701)
- Platine PH-MCK II (D03601)
- Platine PH-F (D05901)
- Platine PH-LSX (D01702)



Light Current Regulator
- Platine AM-O-LSR (D08301)

Photometer
- Platine PH-O-RK (D02501)
- Platine PH-O-RA (D06401)
- Platine PH-O-HZ (D06501)

Amplifier & AD-Converter
- Platine AM-O-NT (D08301)
- Platine AM-O-BU (D08201)
- Platine AM-O-MV (D08101)
- Platine PH-AD16B (D07001)

Magazine
- Platine PH-K5 (D03401)
- Platine PH-MCK (D00801)
- Platine PH-K1 (D03001)
- Platine PH-K2 (D03101)
- Platine PH-K3 (D03201)
- Platine PH-K4 (D03301)
- Platine PH-K-A1 (D04001)
- Platine ADAP15 (D04101)

Reagent-Plasma-Tray
- Platine AM-RPB (D00301)
- Platine PH-MCK II (D03601)

Mechanical Measuring Unit
- Platine AM-M-SH (D06901)
- Platine AM-M-HT (D06301)
- Platine PH-M-MB (D05601)
- Platine PH-HALL (D05201)
- Platine PH-TF (D06801)
- Platine AM-S-HY (D06201)
- LTP DIL (251960)

Reagent Temperature Control
- Platine PH-R2R (D06101)
- Platine PH-M-MB (D05601)
- Platine PH-MCK (D00801)

Incubation Rail
- Platine AM-I-HZ (D07401)

14. LIS

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	14.1.4	Result /Test Order	14 – 1
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14.1 Bidi-Protocol

14.1.1 Data Records

All data records are type SDF (Space Defined):

14.1.2 **Header** (Length 16 characters)

FIELD	Data type	Link	Channel Number	Note
RECTYPE	TEXT	left	1	"H"
WSID	TEXT	left	5	instrument ID: "AMAX"
LDATE	TEXT	left	10	Date of the list

14.1.3 **Identification** (Length 61 characters)

FIELD	Data type	Link	Channel Number	Note
RECTYPE	TEXT	left	1	"I"
ID	TEXT	left	20	ID-Code
NAME	TEXT	left	40	name and surname
DEPT	TEXT	left	20	Ward
NOTE	TEXT	left	40	note

14.1.4 **Result / Test Order** (Length 65 or 29* characters)

FIELD	Data type	Link	Channel Number	Note
RECTYPE	TEXT	left	1	"D"
ID	TEXT	left	20	Sample ID
REQ	TEXT	left	8	Test-code
RESULT1	FLOAT	right	5	Result 1 *
RESULT2	FLOAT	right	5	Result 2 *
RESULT3	FLOAT	right	5	Result 3 *
RESALPHA	TEXT	left	20	Result (Test 33-48) *
ECODE	TEXT	left	1	Error code *

*: These fields may be deleted

14.1.5 ID-Query (Length 26 characters)

FIELD	Data type	Link	Channel Number	Note
RECTYPE	TEXT	left	1	"Q"
WSID	TEXT	left	5	Instrument ID: "AMAX"
ID	TEXT	left	20	Sample-ID

14.1.6 Result (continuous) (Length 70 characters)

Field	Type	Justified	No. chrs	Comment
RECTYPE	TEXT	left	1	"R"
WSID	TEXT	left	5	Instrument ID "AMAX"
ID	TEXT	left	20	Sample ID
REQ	TEXT	left	8	Test-code
RESULT1	FLOAT	right	5	Result 1
RESULT2	FLOAT	right	5	Result 2
RESULT3	FLOAT	right	5	Result 3
RESALPHA	TEXT	left	20	Result (Test 33 - 48)
ECODE	TEXT	left	1	Error code

14.2 Communication Protocol

The following communication protocol is used for both data transmission directions. According to the configuration the CS-190 assumes the function MASTER or SLAVE:

14.2.1 MASTER to SLAVE

Tab. 14.2.1.1

MASTER	SLAVE	Comment
<DLE>		Start communication process
<TC>	<ACK> <TC>	ready
<STX>		
Text ("H.....")		Header is transmitted
<ETX>		
<CHKS>		
<TC>		
	<ACK>	Data checked and OK
	<TC>	
	<NACK>	Error
	<TC>	
(Record is sent again)		
<STX>		
Text ("I.....")		Sample -ID record
<ETX>		
<CHKS>		
<TC>		
	<ACK>	Data checked and OK
	<TC>	
	<NACK>	Error
	<TC>	
(Record is sent again)		
<STX>		
Text ("D.....")		Test order or result record
<ETX>		
<CHKS>		
<TC>		
	<ACK>	Data checked and OK
	<TC>	
	<NACK>	Error
	<TC>	
(Record is sent again)		
"		
"		
<EOT>		End of transmission
<TC>		

14.2.2 SLAVE to MASTER

Tab. 14.2.2.1

SLAVE	MASTER	Comment
	<ENQ>	Start of communication
	<TC>	
<EOT>		No data available
<TC>		
<STX>		
Text ("H.....")		Header is sent
<ETX>		
<CHKS>		
<TC>		
	<ACK>	Data checked and OK
	<TC>	
	<NACK>	Error
	<TC>	
(Record is sent again)		
	<ENQ>	Request next data string
	<TC>	
<STX>		
Text ("I.....")		Sample-ID record
<ETX>		
<CHKS>		
<TC>		
	<ACK>	Data checked and OK
	<TC>	
	<NACK>	Error
	<TC>	
(Record is sent again)		
	<ENQ>	Request next data string
	<TC>	
<STX>		
Text ("D.....")		Test order or result record
<ETX>		
<CHKS>		
<TC>		
	<ACK>	Data checked and OK
	<TC>	
	<NACK>	Error
	<TC>	
(Record is sent again)		
	<ENQ>	Request next record
	<TC>	
<EOT>		No more data available
<TC>		

14.2.3 Command Characters and Symbols

<DLE> ASCII code 10h
<STX> ASCII code 02h
<ETX> ASCII code 03h
<ACK> ASCII code 06h
<NACK> ASCII code 15h
<EOT> ASCII code 04h
<ENQ> ASCII code 05h
<CHKS> Checksum (2 ASCII characters). The checksum is calculated summing the ASCII codes of all characters between <STX> and <ETX>. The module 256 of the sum is converted to its hexadecimal presentation.
<TC> Consists of up to two user definable character strings. (See host parameters)

Timeout
Each data transfer must be acknowledged within 10 sec. Failing to do so will cause the protocol to be aborted.

Repeat after <NACK>
Data strings refused with a <NACK> will be resent up to three times. After resending the third time the protocol will be aborted.

14.2.4 Import (download request orders from LIS to AMAX)

Example (AMAX configured as MASTER):

AMAX: ENQ TC

LIS: STX | H | AMAX1 (5) | TT/MM/YYYY (10) | ETX Checksum TC

AMAX: ACK TC

AMAX: ENQ TC

LIS: STX | I | 11111111 (20)

INSTANCE NAME (40)

LOCATION (20)

Comment (40)

ETX Checksum TC

AMAX: ACK TC

AMAX: ENQ TC

LIS: STX | D | 11111111 (20) | PT (8) | ETX Checksum TC

AMAX: ACK TC

AMAX: ENQ TC

LIS: STX | D | 11111111 (20) | PTT (8) | ETX Checksum TC

AMAX: ACK TC

AMAX: ENQ TC

LIS: STX | I | 11111112 (20)

NEUMANN (40)

LOCATION (20)

Comment (40) ETX Checksum TC

AMAX: ACK TC

AMAX: ENQ TC

LIS: STX | D | 11111112 (20) | PT (8) ETX Checksum TC

AMAX: ACK TC

AMAX: ENQ TC

LIS: STX | D | 11111112 (20) | FIB (8) ETX Checksum TC

AMAX: ACK TC

AMAX: ENQ TC

LIS: EOT TC

14.2.5 Result Transmission (continuously)

AMAX: DLE TC

LIS: ACK TC

AMAX: STX

R	AMAX1	11111111	PT
	5	20	8

12.3	95.4	1.03			ETX Checksum TC
5	5	5	20		

LIS: ACK TC

AMAX: STX

R	AMAX1	11111112	PT
	5	20	8

14.0	74.4	1.10			ETX Checksum TC
5	5	5	20		

LIS: ACK TC

(up to 40 Results)

AMAX: EOT TC

14.2.6 Export (upload from AMAX to LIS)

AMAX: DLE TC

LIS: ACK TC

AMAX: STX | H (1) | AMAX1 (5) | TT/MM/JJJJ (10) | ETX Checksum TC

LIS: ACK TC

AMAX: STX | I (1) | 11111111 (20)

INSTANCE NAME (40)

LOCATION (20)

Comment (40)	ETX Checksum TC

LIS: ACK TC

AMAX: STX | D (1) | 11111111 (20) | PT (8)

12.3 (5)	95.4 (5)	1.03 (5)	(20)		ETX Checksum TC

LIS: ACK TC

AMAX: STX | D (1) | 11111111 (20) | PTT (8)

32.4 (5)	(5)	(5)	(20)		ETX Checksum TC

LIS: ACK TC

AMAX: STX

I	11111112
	20

NEUMANN
40

LOCATION
20

Comment
40

ETX Checksum TC

LIS: ACK TC

AMAX: STX

D	11111112	PT
	20	8

14.0	74.4	1.10		
5	5	5	20	

ETX Checksum TC

LIS: ACK TC

AMAX: EOT TC

14.2.7 ID Query (real-time)

AMAX: DLE TC

LIS: ACK TC

AMAX: STX | Q | AMAX1 | 11111111 | ETX Checksum TC
| | 5 | 20 |

LIS: ACK TC

AMAX: EOT TC

LIS answers with corresponding sample data:

AMAX: ENQ TC

LIS: STX | H | AMAX1 | TT/MM/JJJJ | ETX Checksum TC
| | 5 | 10 |

AMAX: ACK TC

AMAX: ENQ TC

LIS: STX | I | 11111111
| | 20 |

INSTANCE NAME
40

LOCATION
20

Comment	
40	ETX Checksum TC

AMAX: ACK TC

AMAX: ENQ TC

LIS: STX | D | 11111111 | PT | ETX Checksum TC
| | 20 | 8 |

AMAX: ACK TC
AMAX: ENQ TC

LIS:	STX	D	11111111	PTT	ETX	Checksum TC
			20	8		

AMAX: ACK TC

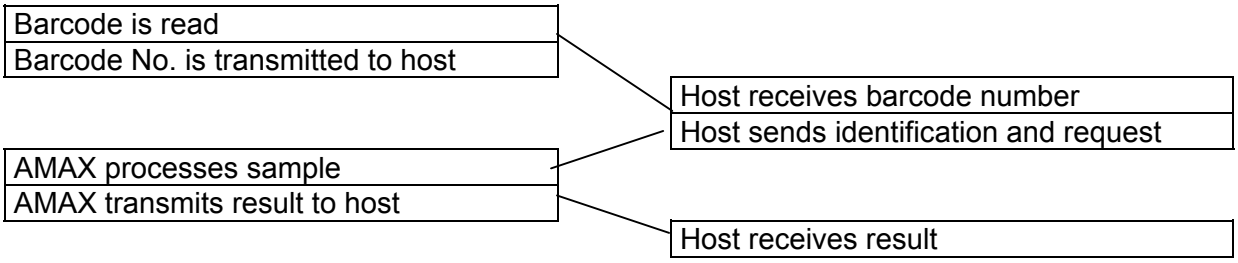
AMAX: ENQ TC

LIS: EOT TC

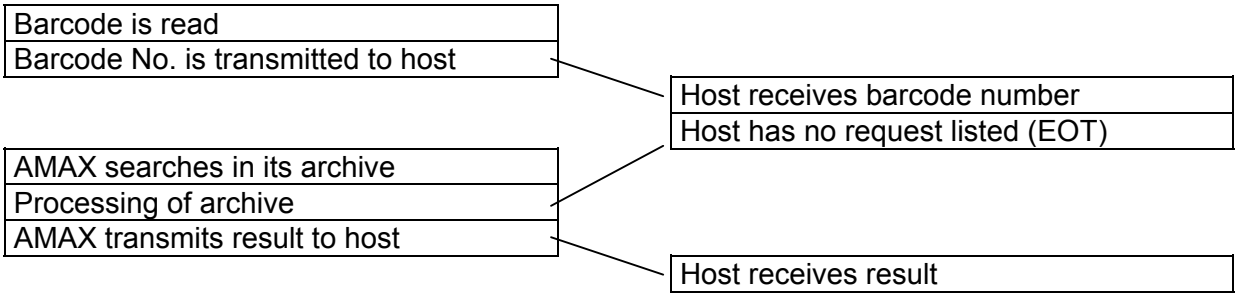
14.3 Host-Communication

14.3.1 Procedure of Processing Real-Time with Barcode

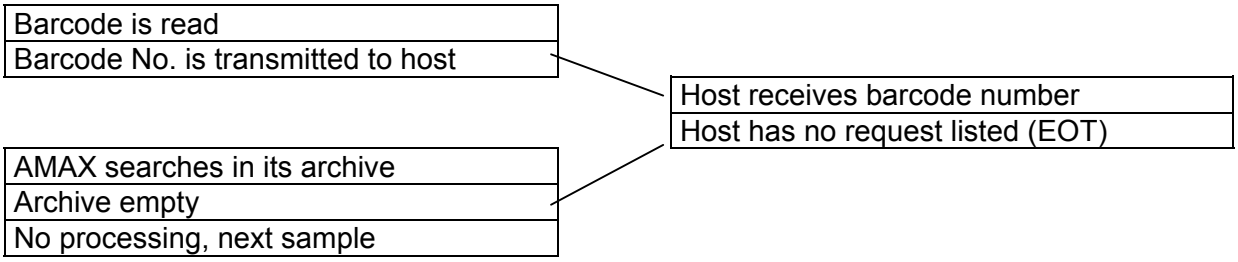
1. Barcode readable and defined in host



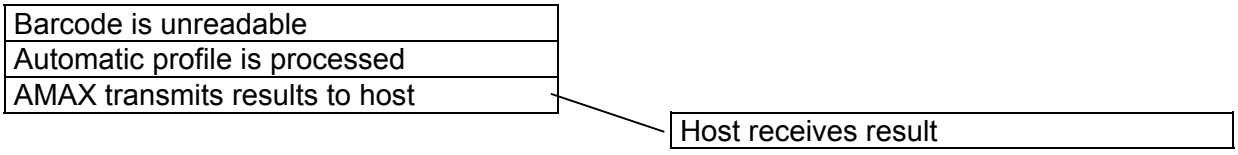
2. Barcode readable, not defined in host, defined in archive



3. Barcode readable, not defined in host, not defined in archive



4. Barcode unreadable, automatic profile defined, NONULBC not defined



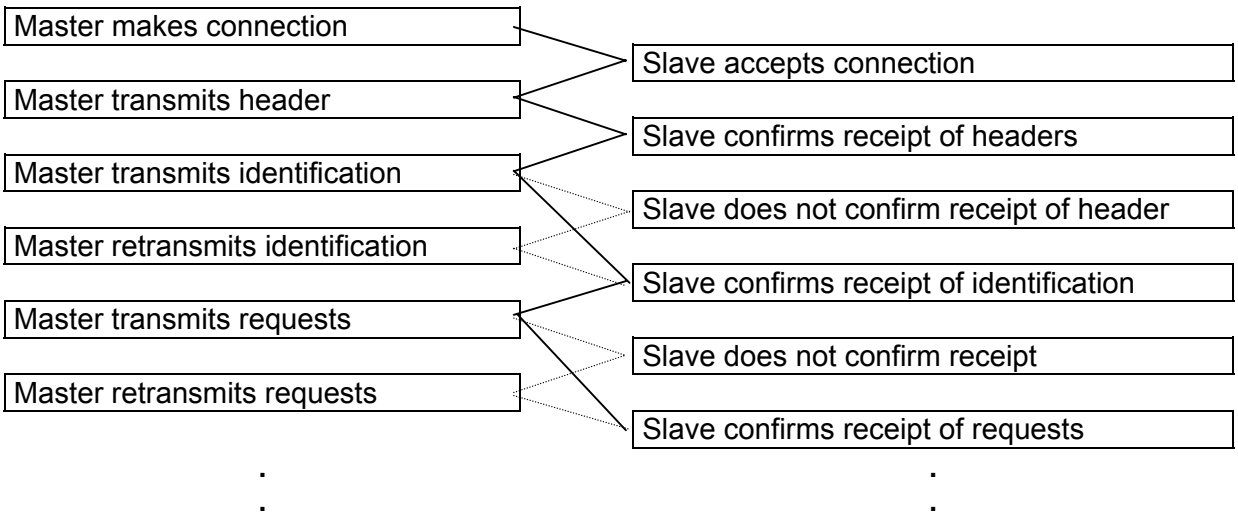
5. Barcode unreadable, NONULBC defined

Barcode is unreadable
Next sample is scanned
At third unreadable barcode - finish

6. Barcode is “Zero”-barcode, NONULBC not defined

Barcode is Zero-Barcode
Next sample is scanned
At third unreadable barcode - finish

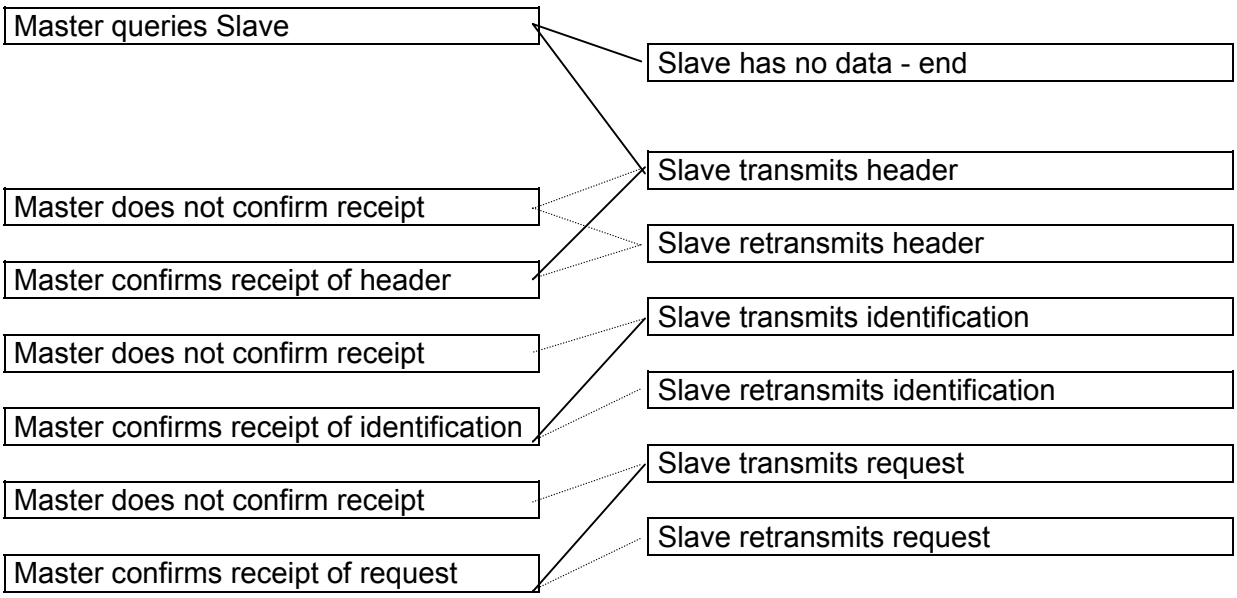
14.3.2 Master to Slave



Until all requests have been transmitted

Master breaks of communication

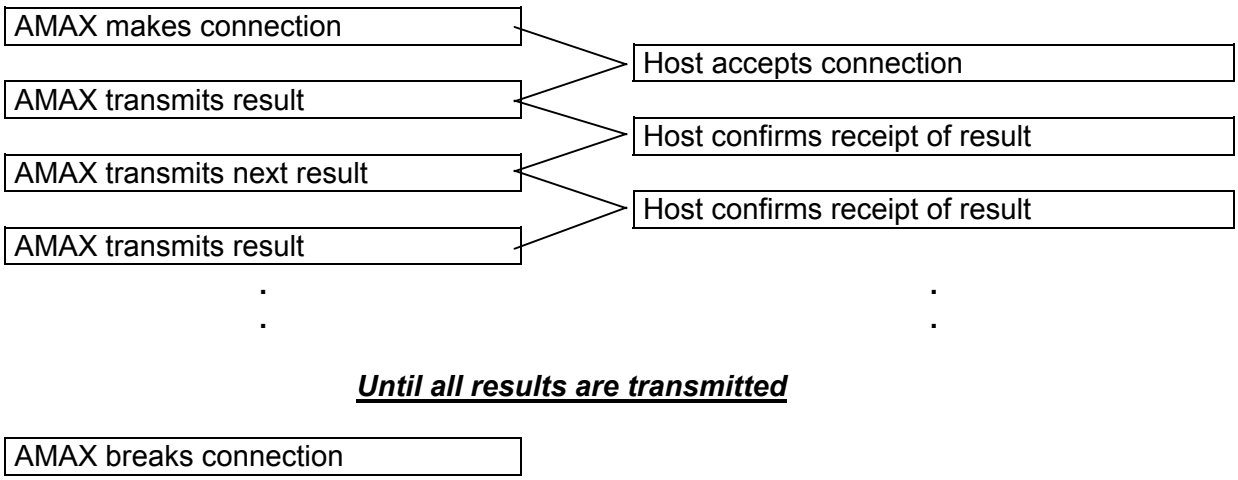
14.3.3 Slave to Master



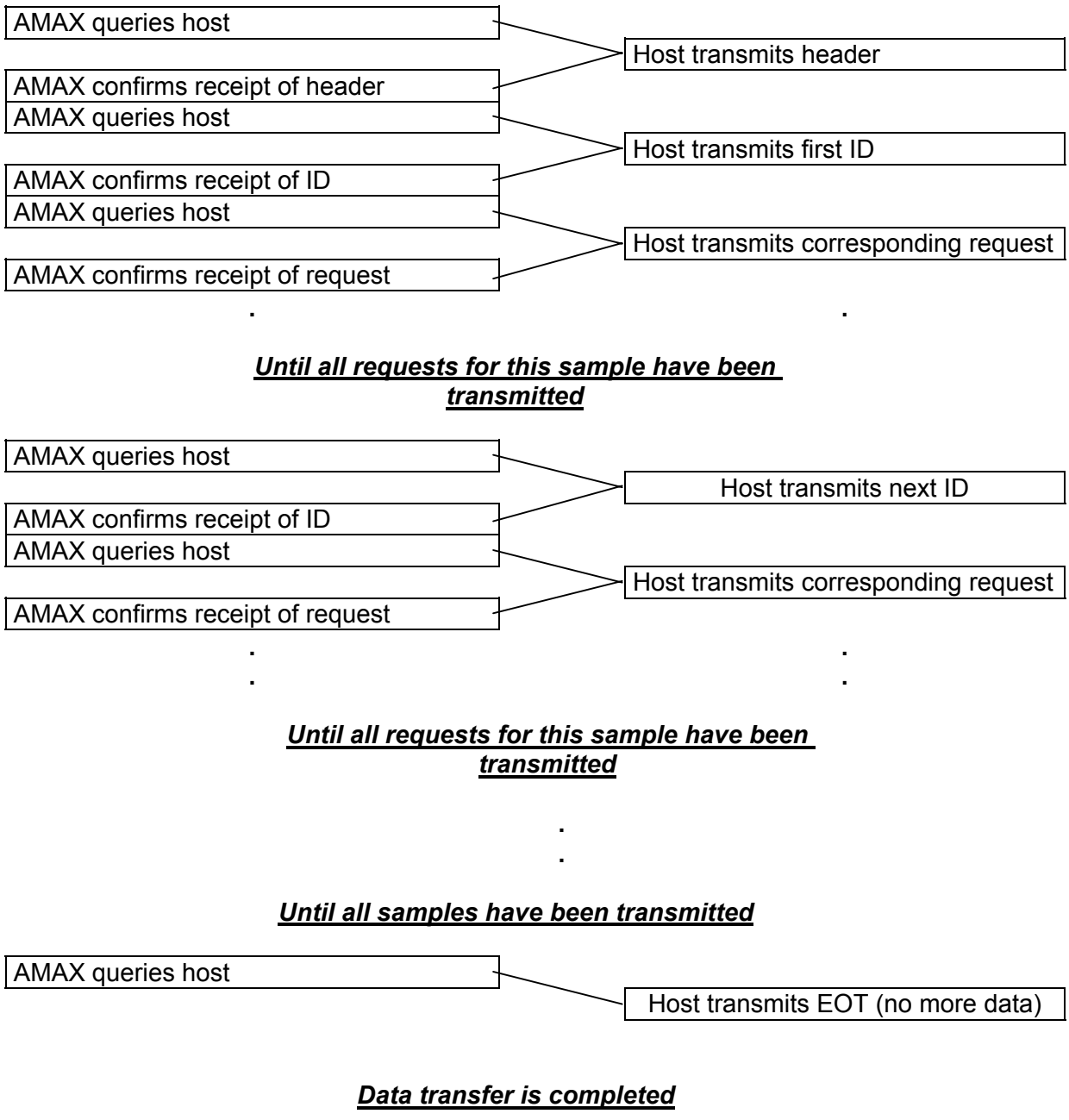
Until all requests have been transmitted

Master breaks of communication

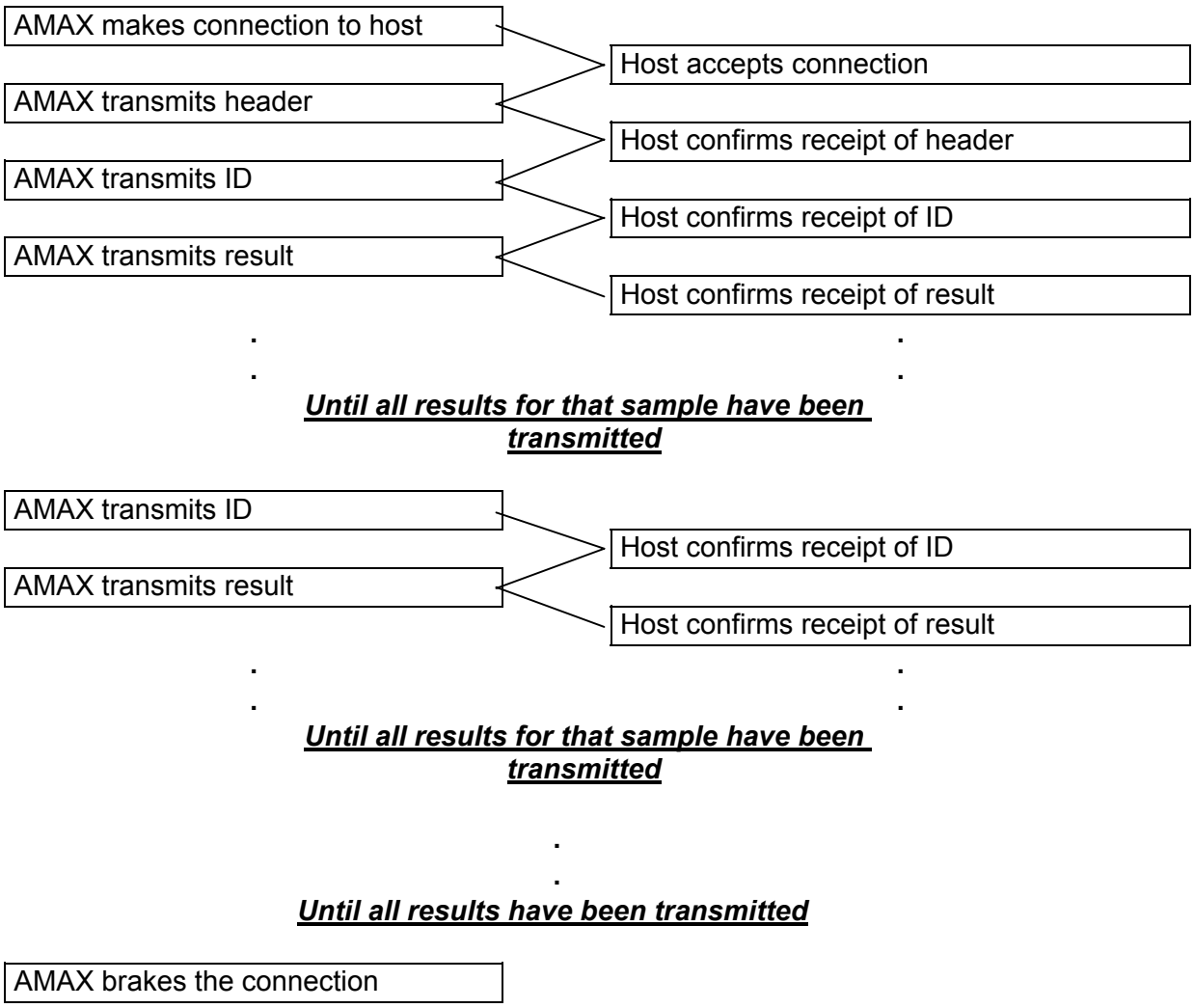
14.3.4 Result Transmission (continuously)



14.3.5 Import of Requests (AMAX = MASTER)



14.3.6 Export of Results (AMAX = MASTER)



15. DOS Parameters

15.1 AMAX CS-190 DOS Parameters 15 – 1
15.2 Files in AMAX Directory 15 – 3

15.1 AMAX CS-190 DOS Parameters

Tab. 15.1.1 shows the **DOS parameters** which can be used to start the AMAX CS-190. When the user software (main menu) is ended, the text on the screen says: C:\AMAX. Now enter **"AMAX ? " or "AMAX HELP"**. A list of possible commands is printed on the screen. The commands can be used directly or be included into the file **"AMAX.INI"**.

Examples:

1. Direct input:

   C:\AMAX\DEMO

2. File AMAX.INI: Open the file with the editor. Enter the desired command and save the file. When the user software (main menu) is started, the change in the AMAX.INI will be executed.

Tab. 15.1.1

? oder HELP	Help text
DEMO	Operating program is entered ignoring the presence of the instrument. The status line will display DEMO in the bottom left corner. The same thing will happen any time the operating program is entered and the instrument is either not present or a signal is not received from the AML-BUS interface board. The instrument is not controlled. If the AML-BUS-board is not detected, the software is started in the DEMO mode automatically.
ITCHK	Incubation time check In CS-190 Status display, incubation times will be displayed in the sample ID area and the test number being processed in the occupied positions of the incubation rail.
AMAX=USEPOOL	All sampling is from Reagent tray position #24
AMAX=TESTREAD	Dilution test Absorbance readings are read before and after addition. Functions only with optical measuring mode and singleton testing.
AMAX=NOREPEAT	Inhibits the auto-repeat function after CV or NC errors when testing in duplicate
AMAX=TEST	As above in AMAX=TESTREAD plus the temperature is recorded in 20 second intervals. Information is dumped into the file: TEMP.DMP
HOST=nn	<nn> defines the transmission retry time of the bi-directional interface in seconds. Without this option, the timeout is 10 seconds.
LPT=HP	Enables a standard HP DeskJet printer driver

DUMP=nn	nn defines a module. All bus communication between the defined module and the PC is dumped to a text file (DUMP.FLE) on the hard drive.
AUTOLAMP	The lamp is not turned on automatically with program initiation. The lamp is turned on only as needed (requested optical tests). The lamp will come on when processing is started on an optical test. After 15 minutes of inactivity, the lamp will turn off. This option can cause considerable wear and a shortening of the lamp life unless optical tests are only run on rare occasions. Optical tests using the One-Step or Two-Step Pipetting Modes, cause the lamp to be turned on at the start of processing. The lamp status will no longer be displayed in red and therefore not initiate error messages.
AMAX=NONULBC	Disables the not readable barcode function using a zero bar-code
HOST=DUMP	All LIS communications (in and out) are dumped to a text file (HOSTDUMP.TXT) on the hard drive of the commander PC.
NOBCCHK	Available on versions 3.1.13 or above Samples are rescanned before actual plasma aspiration begins. If on a sample position a different barcode is read as at the initial scanning, that sample will not be processed and in place of a result an error code 6 will be displayed (Error code 6: ID-Error). This function can be disabled using this DOS parameter.
HOST=NORESEND	Available on versions 3.1.13 or above Inhibits the repeated transmission of results after faulty attempts. Ensures that the host is not continuously busy because of host failures and thus stops processing.
NOREFILLTANK	Prevents monitoring of the level of fluids in all fluid reservoirs If refilling is required in any of the fluid reservoirs, a message is displayed requesting that the reservoir be filled.
ARCPRIO	Available on versions 3.1.13 or above When operating in real-time mode, gives the patient archive request data priority over data received from the host.

15.2 Files in AMAX Directory

In table 15.2.1 the files found in directory C:\AMAX and their functions are listed.

Specific files can be accessed and changes made using the DOS Editor.

Tab. 15.2.1

File Name	Contents	Text	Could file be missing
AMAX.CCL	Colour tables To adjust use **<ALT+F9>** and **<ALT+F10>**	No	Yes
AMAX.CFG	Configuration of the measuring channels Contains only one number 1= optical only 2= mechanical only 3= mechanical and optical	Yes	Yes
AMAX.EXE	AMAX-Programme	No	No
AMAXHELP.nnn	Help Text Files	No	Yes
BARCODE:INI	Initialisation sequence for integrated barcode scanner; adjust with the Service Software	No	Yes
BCMASK.DAT	Parameters for manipulation of the barcodes Contains two numbers: 1st number = Number of digits (from the left) to be deleted 2nd number = Number of digits (from the right) to be deleted	Yes	Yes
CUPCOUNT.DEF	Cuvette counter Contains four numbers	Yes	Yes
DEMI16BI.OVL	Protected-Mode Runtime library	No	No
DRIVE.DAT	Disc drive and pathway for storing the patient archive	Yes	No
DUMP.FLE	Log of bus-communication with a designated module (activate with parameter DUMP=n)	Yes	Yes
EGAVGA.BGI	Graphic Driver	No	No
EXPOT.BUF	Data-buffer Used by HOST.DLL (Bidi-Drive)		
HOST.DLL	Bidi-Host Drive	No	Yes
HOST.PRM	Parameter for the Bidi-Host Drive	No	Yes
HOSTPAT.DAT	Recorded patient data, still to be transferred into the patient archive	No	Yes
IMPORT.BUF	Data buffer used by HOST.DLL (Bidi-Drive)	No	Yes
IOAMAX.DLL	Programme manager	No	No
LOGCMD.DAT	Command list: hit **<ALT+F5>** to see The file is not readable as clear text.	Yes	Yes

MEASLOCK.DAT	Table of locked off measuring cells The file contains one line of 8 digits. Left to right the digits correspond to the 4 optical and the 4 mechanical measuring channels. One “X” blocks the corresponding channel, every other digit does not.	Yes	Yes
MEASM.DEF	Specially chosen and letter coded measuring modes To set up open menu System/Parameter/Measuring-modes.	No	Yes
OFFSET.DAT	XYZZ-Robot alignment values To alter use the Service Software	No	Yes
ONLINE.PRM	Parameters for the unidirectional interface To alter use menu System/Parameter/On-Line.	No	Yes
OPTION.TAB	Option Set-ups	No	Yes
PASSWD.DAT	Password - contents are coded Use the passepartout (over-ride password) if there is no file.	No	Yes
PHOREF.DEF	Photometer calibration values The first 4 values correspond to measurement with water, the next four values correspond to the dark values. (ADW-Offsets)	Yes	Yes
PHOTO.BIN	Photometer measuring programme	No	No
PHOTOM.VER	Photometer loading programme version	Yes	Yes
PROFIL.DAT	Test profiles Set up using menu System/Profile.	No	Yes
PUMP.DEF	Pump parameters	No	Yes
REAG.DEF	Reagent definitions	No	Yes
REAGL.DEF	Reagent tray configurations	No	Yes
REFERTO.DAT	Report format	No	Yes
REPARTI.DAT	Department/Ward	No	Yes
RTM.EXE	Protected-Mode stub	No	No
STAT.DAT	Quality controls	No	Yes
TCORR.DAT	Time correction factors Two factors (A and B) can be entered for every test to correct the time values (one line/Test). Time value (corr) = Time value (measured) x A+B	Yes	Yes
TEMPO.DAT	Correction values for the temperature displays The file contains 5 values. The correction values (0.1 grade-units) will be added to the measured temperature. The values are listed in following order: Reagent tray, probes, opt. meas. cell, mech. meas. cell, incubation rail.	Yes	Yes

TEMPWIN.DEF	Temperature observation window To alter use menu System/Parameter/Temperatures.	No	Yes
TEST.DAT	Test parameters To alter use menu System /Parameter /Tests.	No	No
TESTG.DEF	Test groups To alter use menu System /Parameter /Test groups.	No	Yes
TSTX.EXE	Programme for adaptation of test parameters from version 2.X to 3.0 **Attention:** use once only!	No	Yes
TUBE.DEF	Levels To alter use menu System /Parameter /Levels.	No	Yes
VCORR.DAT	Correction factors for TWO-STEP sampling mode **First line:** "A" or "P"; A = absolute correction P = proportional correction Further lines contain 12 values. Minimum of one space to separate the values. Columns created in this way will be placed according to test-group size e.g. group=4 - the correction factor will be placed in column 4. **Second line:** Back-lash volume (12 values in microliter) **3rd - 14th lines:** when the first line = "P", values are correction factors of the last to the first sampling. (e.g. 1.03 = 103%), when the first line = "A", then the values are backlash volumes of the last to the first samplings.	Yes	Yes

Customer:	
Customer no.:	
Instrument no. internal:	
Instrument no. external:	
Last maintenance :	

Please mark:

Working Point:	**Activity** tested/ checked	**Activity** **(1) replaced (3) lubricated (2) cleaned (4) adjusted**	**Spare Part No. Amelung/Sigma**
System Fluid Circuits			
Coolant filter (replace)	o	**(1) o (2) o (3) o (4) o**	241071/W0514
System fluid	o	**(1) o (2) o (3) o (4) o**	830040/A0589
Air filter (condition)	o	**(1) o (2) o (3) o (4) o**	120396/S9303
Tubing System			
Check coolant tubing for deposits	o	**(1) o (2) o (3) o (4) o**	
Check waste water pump tubing for blockages and leaks (Check functioning of the pump)	o	**(1) o (2) o (3) o (4) o**	241051/W1014
Check waste water tubing (well) for blockages	o	**(1) o (2) o (3) o (4) o**	
Check tubing set *fresh water* Test function of the fluid level sensor (BNC-plug)	o	**(1) o (2) o (3) o (4) o**	Q90006/T3062
Check tubing set *waste water* Test function of the fluid level sensor (BNC-plug)	o	**(1) o (2) o (3) o (4) o**	Q90007/T3187
XYZZ-Robot			
Clean and lubricate all axes, shafts, guides and gliding rails	o	**(1) o (2) o (3) o (4) o**	
Driving belt (tension)			
Toothed belt (X-motor-pinion)	o	**(1) o (2) o (3) o (4) o**	120448/T2312
Toothed belt (X-drive)	o	**(1) o (2) o (3) o (4) o**	120449/T2062
Toothed belt(Y-motor-pinion)	o	**(1) o (2) o (3) o (4) o**	120453/T1062
Toothed belt (Y-drive)	o	**(1) o (2) o (3) o (4) o**	120451/T1187
Needle (condition, function)	o	**(1) o (2) o (3) o (4) o**	D10082/A1708
Temperature needle heating (41±1.0°C container)	o	**(1) o (2) o (3) o (4) o**	
Cuvette Magazine			
Clean and lubricate all axes, shafts, guides and gliding rails	o	**(1) o (2) o (3) o (4) o**	
Disposal conveyor (function)	o	**(1) o (2) o (3) o (4) o**	
Cuvette chute mounting lifting solenoids (function)	o	**(1) o (2) o (3) o (4) o**	

Working Point:	**Activity** tested/ checked	**Activity** (1) replaced (2) cleaned (3) lubricated (4) adjusted	**Spare Part No. Amelung/Sigma**
Reagent-Plasma-Tray			
Toothed belt pinion primary shaft (tension)	O	(1) O (2) O (3) O (4) O	120461/
Toothed belt motor pinion (tension)	O	(1) O (2) O (3) O (4) O	120462/
Cooling (16.5±1.5°C)	O	(1) O (2) O (3) O (4) O	
Photometer			
Measuring channels (dirt)	O	(1) O (2) O (3) O (4) O	
Cuvette holding springs (tension)	O	(1) O (2) O (3) O (4) O	120924/C6716
Electrical adjustments	O	(1) O (2) O (3) O (4) O	
Lamp voltage (lamp condition)	O	(1) O (2) O (3) O (4) O	247410/A3335
Temperature (37.5±0.3°C)	O	(1) O (2) O (3) O (4) O	
Mechanical Measuring Unit			
Cuvette holding springs (tension)	O	(1) O (2) O (3) O (4) O	359412/C6591
Drive belt (tension)	O	(1) O (2) O (3) O (4) O	120440/F7173
Hinge mechanism (Performance check)	O	(1) O (2) O (3) O (4) O	
Temperature (37.5±0.3°C)	O	(1) O (2) O (3) O (4) O	
Dilutor Unit			
Dilutor syringe (integrity)	O	(1) O (2) O (3) O (4) O	290007/A1833
Plunger (teflon)	O	(1) O (2) O (3) O (4) O	350350/S9178
O-ring	O	(1) O (2) O (3) O (4) O	350121/S03015
Toothed belt (condition)	O	(1) O (2) O (3) O (4) O	120505/
Level Sensor/Height Scanner			
Z-axis (function)	O	(1) O (2) O (3) O (4) O	

Test run: Instrument OK.	
Maintenance carried out on	
Next maintenance	
Technician signature	
Customer signature	